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(12) **United States Patent**
Hashimoto

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(54) **IMAGE PROCESSING APPARATUS**

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(73) Assignee: **CANON KABUSHIKI KAISHA** (JP)

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**
G08B 23/00 (2006.01)
G03G 15/00 (2006.01)

(52) **U.S. Cl.**
CPC ***G03G 15/5004*** (2013.01)

(58) **Field of Classification Search**
USPC 340/573.1, 541, 552, 523; 399/16, 53, 399/389, 405
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,437,089 A * 3/1984 Achard G08B 13/2491 250/DIG. 1
4,733,081 A * 3/1988 Mizukami G07C 9/00 250/221
5,225,806 A * 7/1993 Stanley-Arslanok .. G08B 25/14 340/506
5,689,235 A * 11/1997 Sugimoto G08B 13/22 340/531
5,777,755 A * 7/1998 Aoki H04N 1/047 358/404
5,798,703 A * 8/1998 Sakai F16P 3/12 307/119
5,819,013 A * 10/1998 Miyazaki H04N 1/00278 347/3
5,933,581 A * 8/1999 Miyazaki H04N 1/00278 358/1.14
6,252,506 B1 * 6/2001 Hsieh G08B 13/1645 250/338.3
6,320,510 B2 * 11/2001 Menkedick 340/5.1
6,331,818 B1 * 12/2001 Hiraga A61B 5/0013 340/573.1
6,456,403 B1 * 9/2002 Archer H04N 1/00795 358/468
6,620,108 B2 * 9/2003 Duval A61B 5/18 340/573.1
6,658,218 B2 * 12/2003 Krolczyk B65H 43/00 399/16
6,812,835 B2 * 11/2004 Ito G08B 13/19604 340/541
6,911,907 B2 * 6/2005 Kelliher G07C 9/00166 340/5.1
6,943,685 B2 * 9/2005 Seo G08B 13/191 340/541
6,948,081 B2 * 9/2005 Lee G06F 1/3218 713/310
7,023,568 B2 * 4/2006 Tsunekawa H04N 1/00633 271/298
7,057,519 B2 * 6/2006 Study G05B 19/0428 318/280

(Continued)

FOREIGN PATENT DOCUMENTS

EP 444227 A * 9/1991
JP 01267711 A * 10/1989 .... G06F 1/00

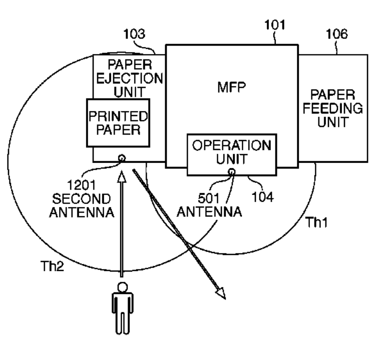
(Continued)

Primary Examiner — Paul Obiniyi
(74) *Attorney, Agent, or Firm* — Rossi, Kimms & McDowell LLP

(57) **ABSTRACT**

An image processing apparatus that enables to prolong lives of device parts of which lives are limited by preventing unnecessary returns from the power saving mode, and reduce unnecessary power consumption. A first living body detection unit detects a living body that approaches the apparatus to input a trigger. A second living body detection unit detects a living body that approaches the apparatus for other purposes. A switching unit switches a mode from a first electric power mode to a second electric power mode when the first living body detection unit detects the living body and when the second living body detection unit does not detect the living body, and maintains the first electric power mode when the first living body detection unit detects the living body and when the second living body detection unit detects the living body.

12 Claims, 13 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

7,248,174	B2 *	7/2007	Study	G05B 19/0428	318/280
7,260,751	B2 *	8/2007	Fujinawa	G06F 3/121	710/15
7,286,871	B2 *	10/2007	Cohen	A61B 5/04017	600/300
7,307,359	B2 *	12/2007	Takaku	B60K 37/00	307/10.1
7,367,133	B2 *	5/2008	Hagl	G01B 21/045	33/503
7,427,914	B2 *	9/2008	Plantamura	B60W 50/14	340/425.5
7,428,391	B2 *	9/2008	Kobayashi	G03G 15/5004	399/88
7,466,224	B2 *	12/2008	Ward	G07C 9/00111	340/5.2
7,555,754	B2 *	6/2009	Fujinawa	B41J 29/38	714/44
7,660,018	B2 *	2/2010	Shimizu	G06T 7/0002	358/3.26
7,973,777	B2 *	7/2011	Lee	G06F 3/0414	345/175
7,978,084	B2 *	7/2011	Dixon	A61G 7/05	340/286.07
8,015,421	B2 *	9/2011	Chang	G06F 1/3203	713/300
8,024,499	B1 *	9/2011	Aybay	H04L 12/403	710/46
8,089,645	B2 *	1/2012	Soda	G06K 15/005	358/1.14
8,135,118	B2 *	3/2012	Nakagawa	H04M 1/82	379/142.04
2001/0003356	A1 *	6/2001	Yon	G01J 5/10	250/338.1
2002/0015171	A1 *	2/2002	Tsunekawa	H04N 1/00633	358/1.13
2003/0014675	A1 *	1/2003	Lee	G06F 1/3218	713/310
2003/0117711	A1 *	6/2003	Kowarz	H04N 5/7416	359/618
2003/0123886	A1 *	7/2003	Krolczyk	B65H 43/00	399/16
2004/0061283	A1 *	4/2004	Hyun	B65H 7/02	271/265.01
2004/0097802	A1 *	5/2004	Cohen	A61B 5/04017	600/411
2004/0113771	A1 *	6/2004	Ozaki	A61B 5/0002	340/539.12
2004/0222891	A1 *	11/2004	Ehlers	G08B 21/0211	340/573.1
2005/0068165	A1 *	3/2005	Kelliher	G07C 9/00166	340/523
2005/0093368	A1 *	5/2005	Takaku	B60K 37/00	307/10.1
2005/0144623	A1 *	6/2005	Fujinawa	B41J 29/38	719/318
2005/0198223	A1 *	9/2005	Fujinawa	G06F 3/121	709/220
2005/0204144	A1 *	9/2005	Mizutani	G06F 3/1222	713/182
2005/0242484	A1 *	11/2005	Ono	B65H 39/042	271/6
2005/0286437	A1 *	12/2005	Matsushita	H04L 63/061	370/252
2006/0006316	A1 *	1/2006	Takenaka	G05D 1/0272	250/221
2006/0007467	A1 *	1/2006	Tsunekawa	H04N 1/00633	358/1.13
2007/0001835	A1 *	1/2007	Ward	G07C 9/00111	340/522
2007/0014586	A1 *	1/2007	Kobayashi	G03G 15/5004	399/70
2007/0109605	A1 *	5/2007	Shimizu	G06T 7/0002	358/3.26
2007/0242860	A1 *	10/2007	Hasebe	G06K 9/00255	382/118
2007/0280706	A1 *	12/2007	Yasukawa	G03G 15/5079	399/8
2007/0286656	A1 *	12/2007	Ito	G03G 15/70	399/389
2008/0054550	A1 *	3/2008	Hama	B65H 31/26	271/220
2008/0130858	A1 *	6/2008	Nakagawa	H04M 1/82	379/207.03
2008/0163363	A1 *	7/2008	Mizutani	G06F 3/1222	726/19
2008/0165002	A1 *	7/2008	Tsuji	G01S 7/40	340/552
2008/0297837	A1 *	12/2008	Soda	G06K 15/005	358/1.15
2009/0063882	A1 *	3/2009	Chang	G06F 1/3203	713/320
2009/0129802	A1 *	5/2009	Yasukawa	G03G 15/5012	399/53
2009/0257103	A1 *	10/2009	Pellar	H04N 1/46	358/514
2009/0261524	A1 *	10/2009	Nakayama	B65H 3/44	271/3.14
2009/0303375	A1 *	12/2009	Ohyama	H04N 5/23219	348/333.12
2010/0033424	A1 *	2/2010	Kabasawa	G01C 17/28	345/156
2010/0079827	A1 *	4/2010	Matsushima	H04N 1/00567	358/498
2010/0320845	A1 *	12/2010	Chang	G06F 1/3203	307/116
2011/0123242	A1 *	5/2011	Shishikura	G03G 15/6573	399/405

FOREIGN PATENT DOCUMENTS

JP	07225508	A	*	8/1995	G03G 15/043
JP	11-202690	A		7/1999	
JP	11202690	A	*	7/1999	G03G 21/00
JP	11284783	A	*	10/1999	
JP	2000333371	A	*	11/2000	H02J 3/38
JP	2007230001	A	*	9/2007	

* cited by examiner

FIG.1

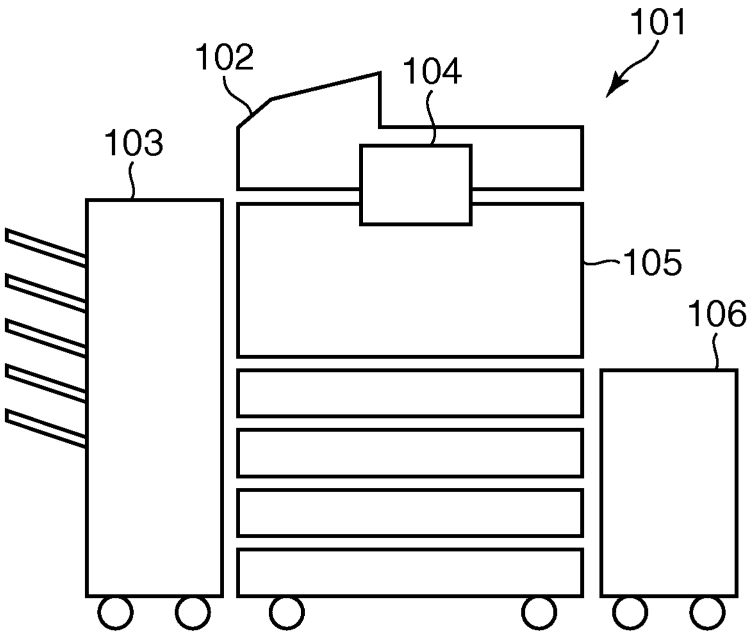


FIG.2

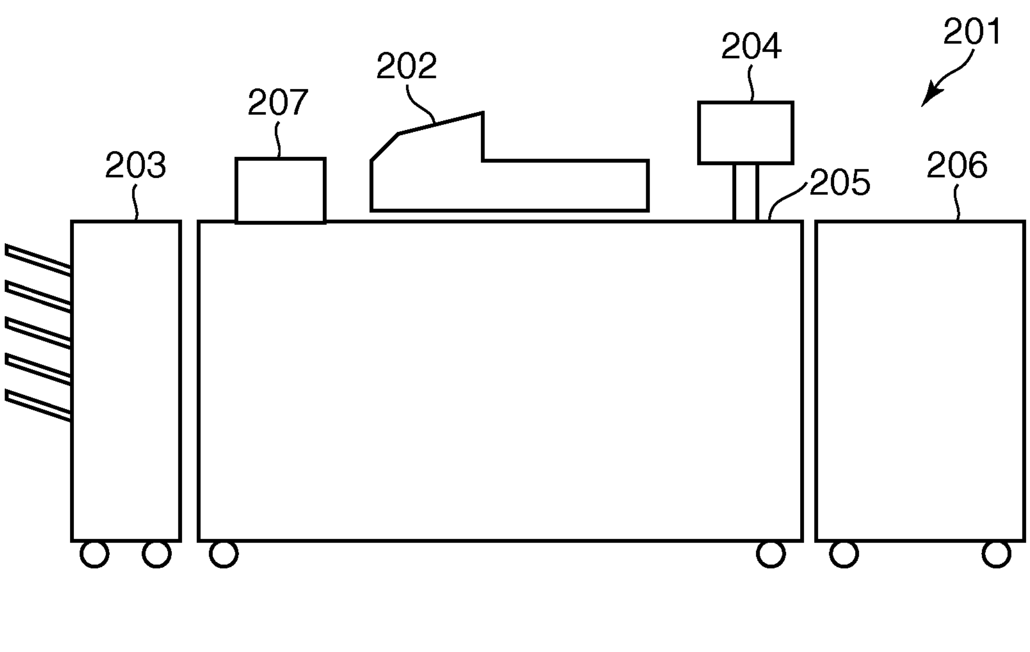


FIG.3

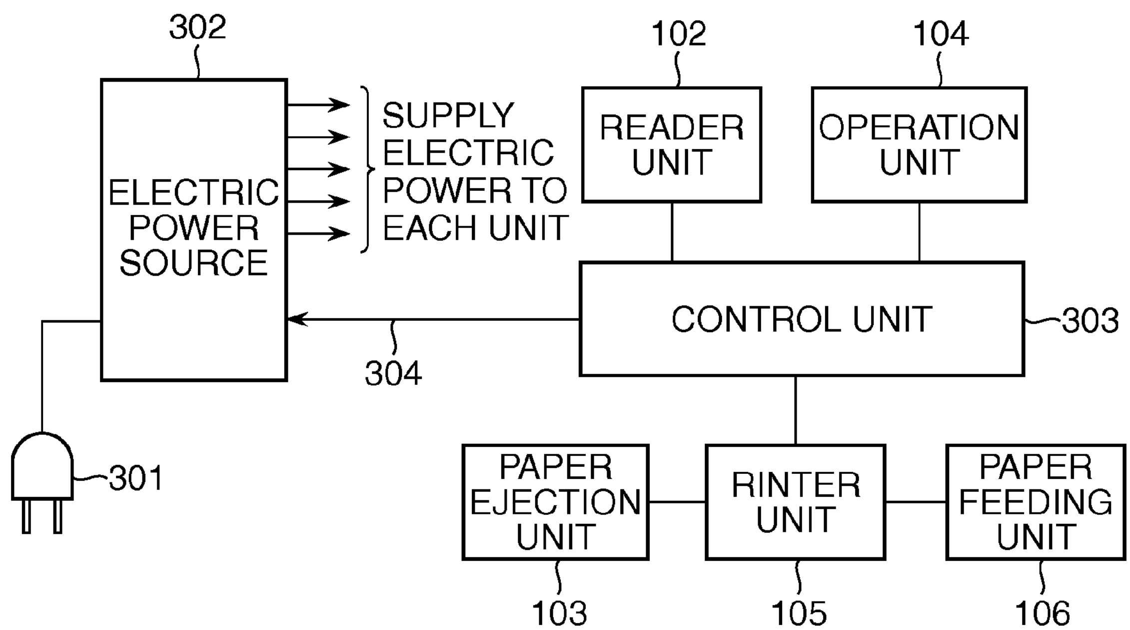

302
ELECTRIC POWER SOURCE
SUPPLY ELECTRIC POWER TO EACH UNIT
102
READER UNIT
104
OPERATION UNIT
CONTROL UNIT
303
304
301
PAPER EJECTION UNIT
RINTER UNIT
PAPER FEEDING UNIT
103
105
106

FIG.4

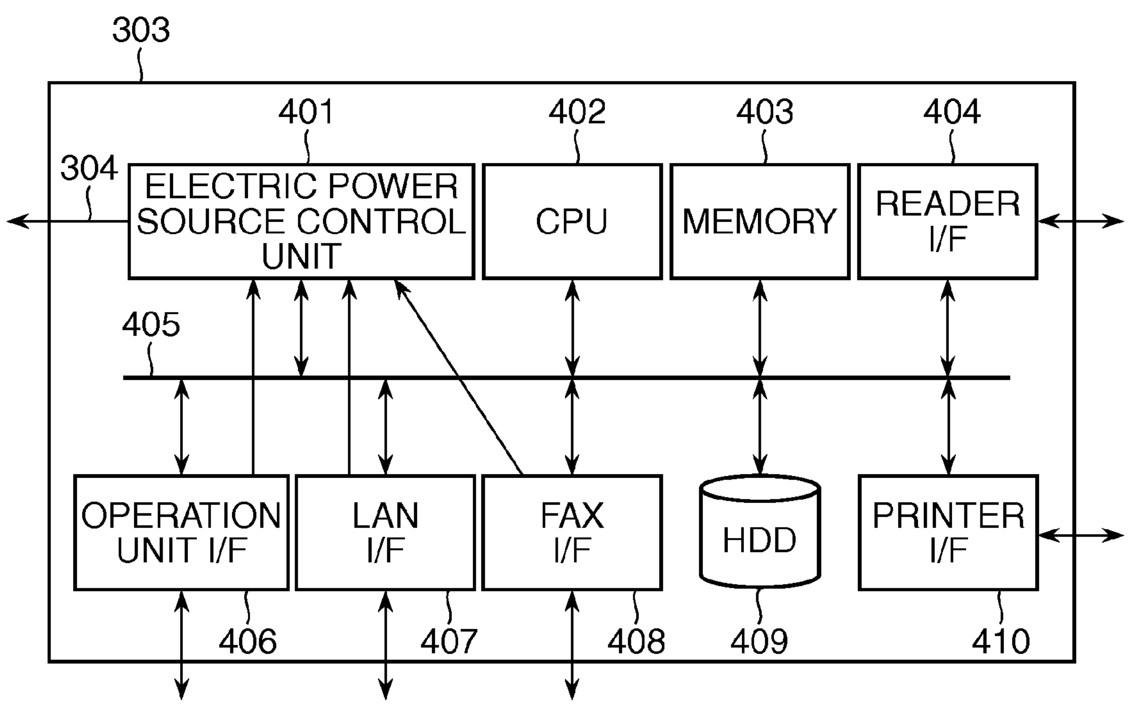

303
401
402
403
404
304
ELECTRIC POWER SOURCE CONTROL UNIT
CPU
MEMORY
READER I/F
405
OPERATION UNIT I/F
LAN I/F
FAX I/F
HDD
PRINTER I/F
406
407
408
409
410

FIG.5

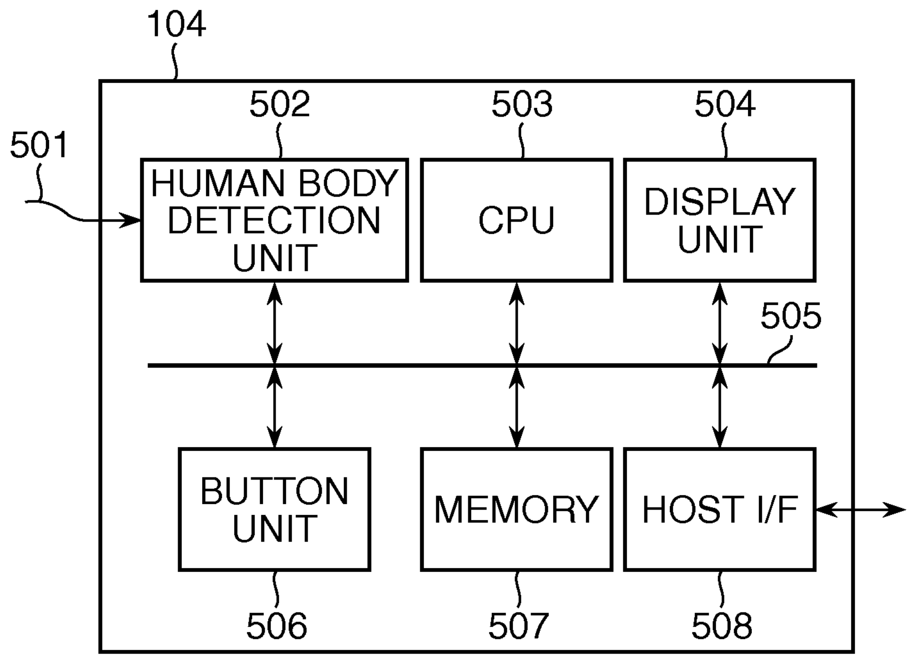

104
501
502
503
504
HUMAN BODY DETECTION UNIT
CPU
DISPLAY UNIT
505
BUTTON UNIT
MEMORY
HOST I/F
506
507
508

FIG.6

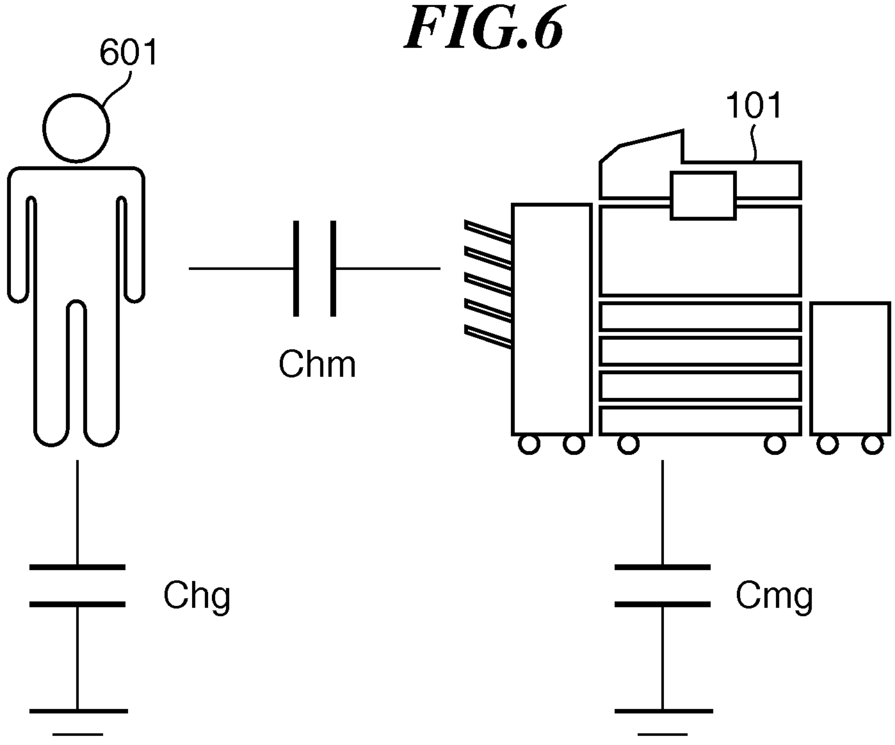

601
101
Chm
Chg
Cmg

FIG.7

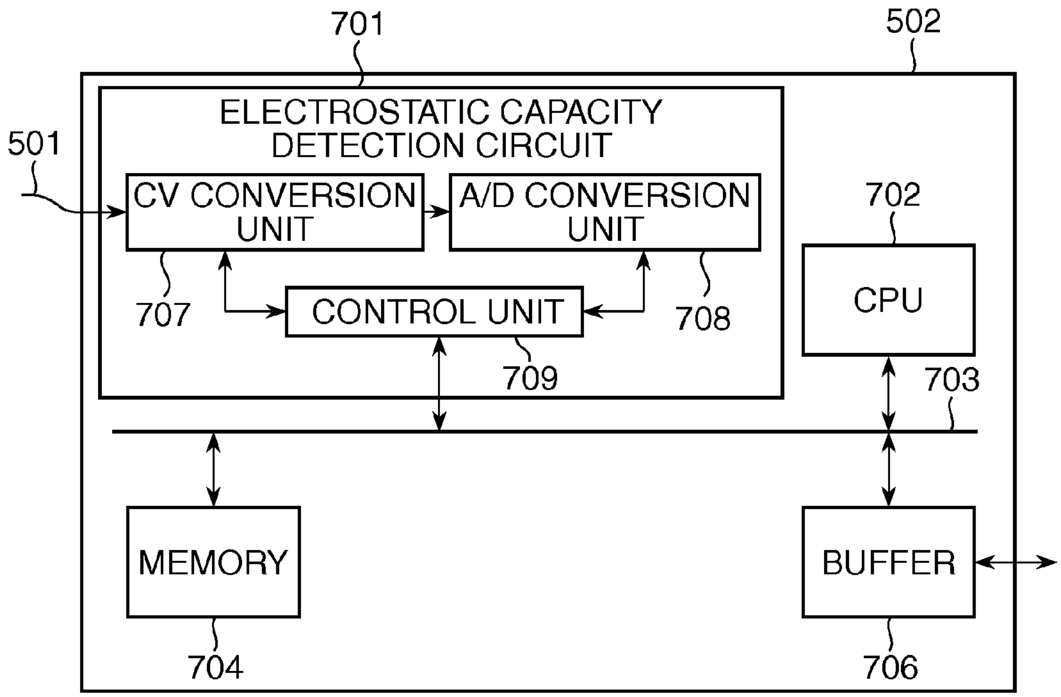

701
502
ELECTROSTATIC CAPACITY DETECTION CIRCUIT
501
CV CONVERSION UNIT
A/D CONVERSION UNIT
702
CPU
707
CONTROL UNIT
708
709
703
MEMORY
BUFFER
704
706

FIG.8

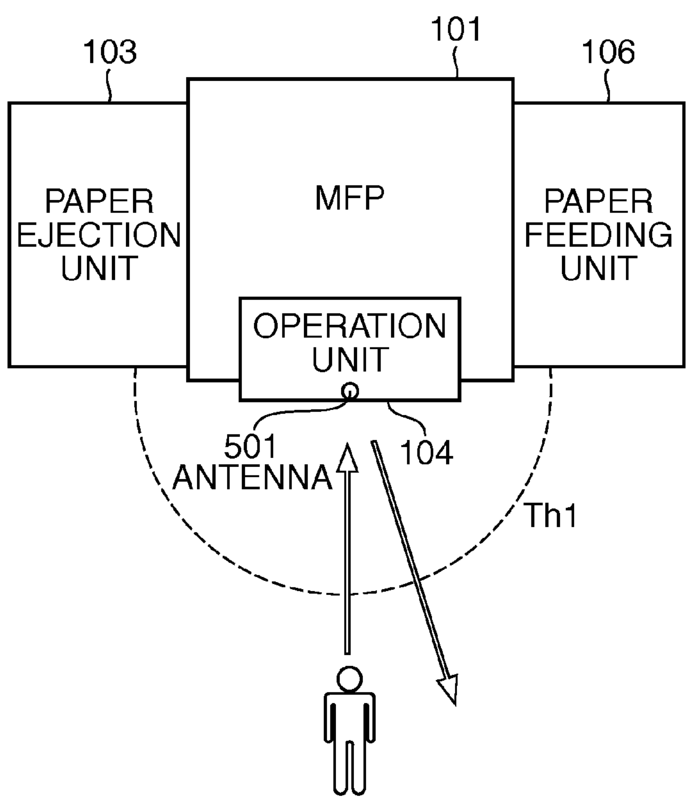

103
101
106
PAPER EJECTION UNIT
MFP
PAPER FEEDING UNIT
OPERATION UNIT
501 ANTENNA
104
Th1

FIG.9

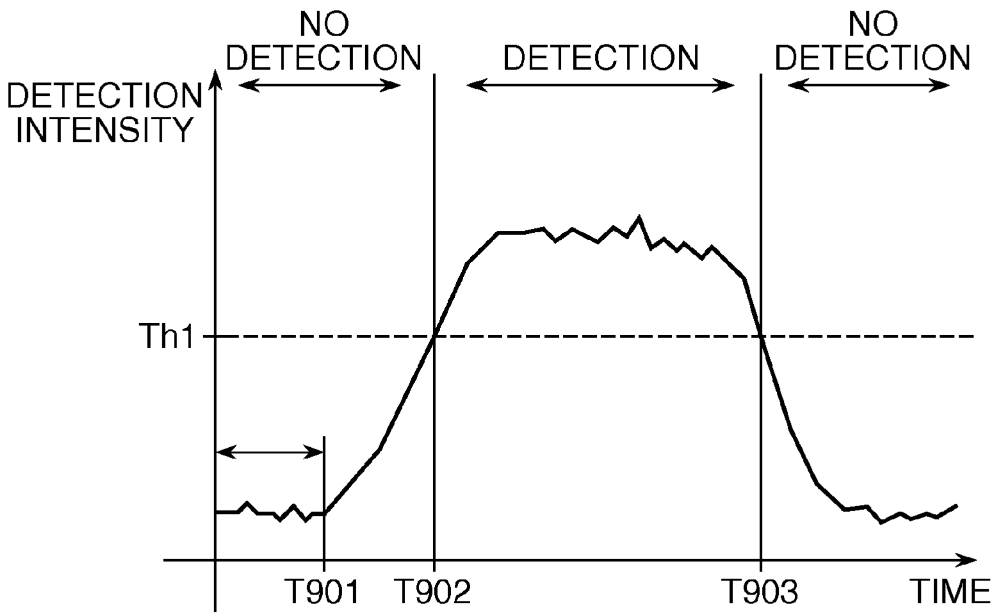

NO DETECTION
DETECTION
NO DETECTION
DETECTION INTENSITY
Th1
T901
T902
T903
TIME

FIG.10

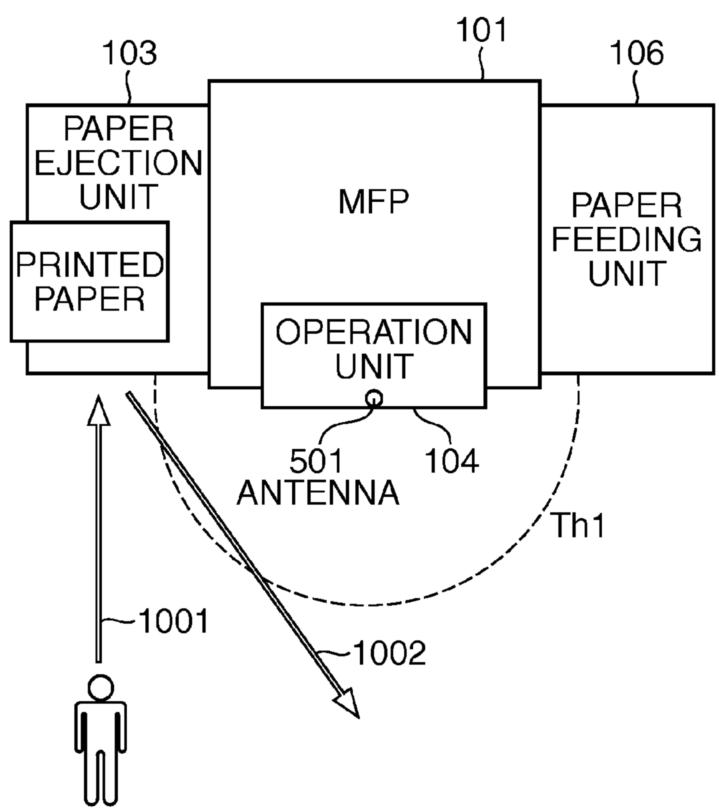

103
101
106
PAPER EJECTION UNIT
PRINTED PAPER
MFP
PAPER FEEDING UNIT
OPERATION UNIT
501 ANTENNA
104
Th1
1001
1002

FIG.11

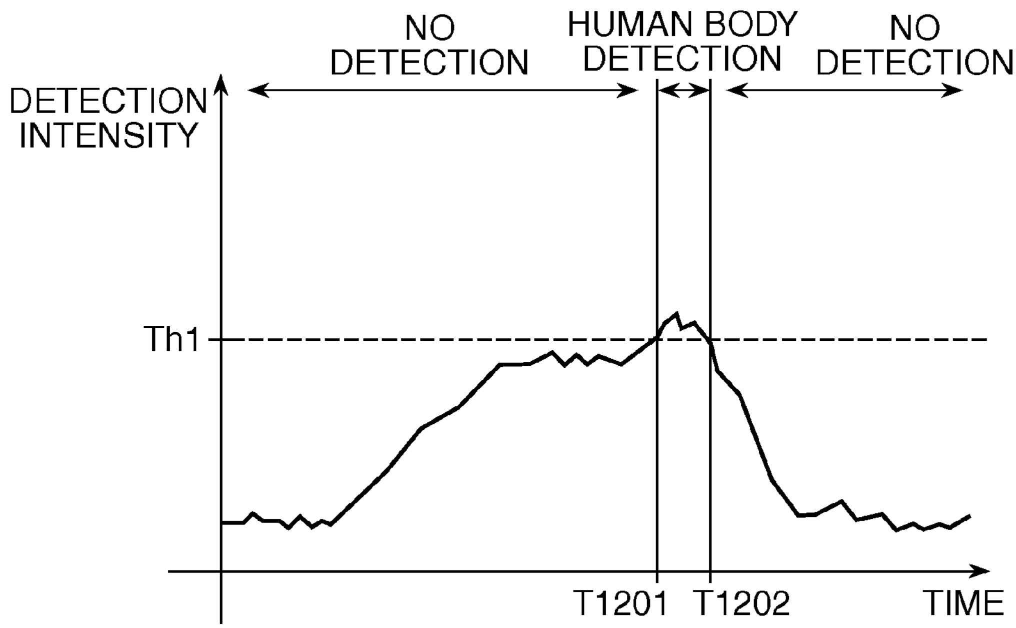

NO DETECTION
HUMAN BODY DETECTION
NO DETECTION
DETECTION INTENSITY
Th1
T1201
T1202
TIME

FIG.12

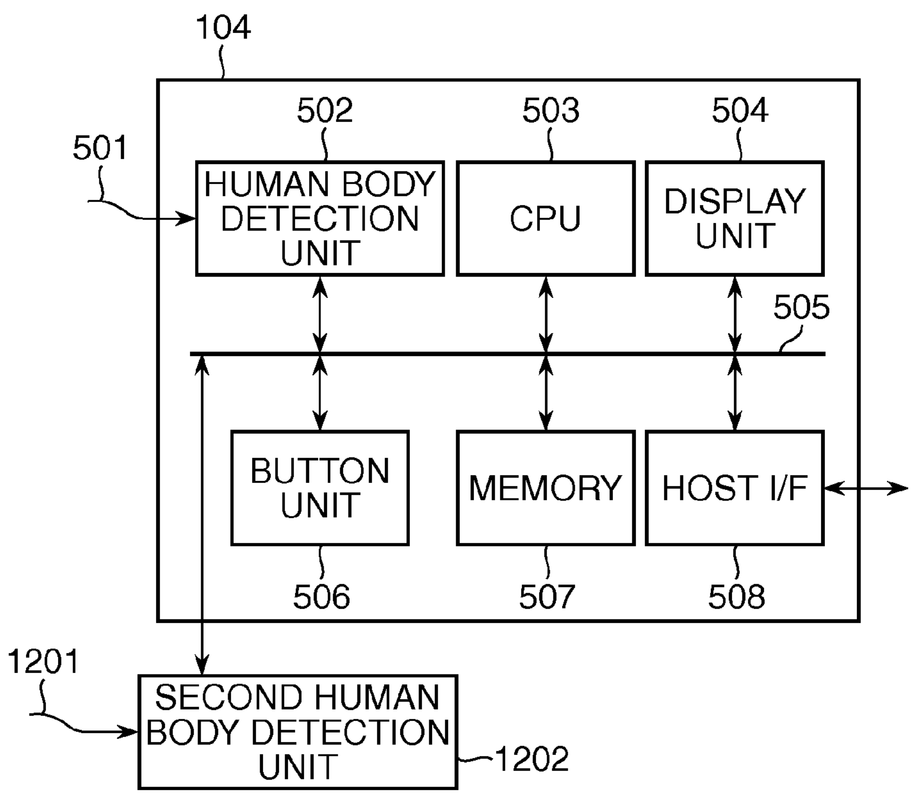

104
501
502
503
504
HUMAN BODY DETECTION UNIT
CPU
DISPLAY UNIT
505
BUTTON UNIT
MEMORY
HOST I/F
506
507
508
1201
SECOND HUMAN BODY DETECTION UNIT
1202

FIG.13

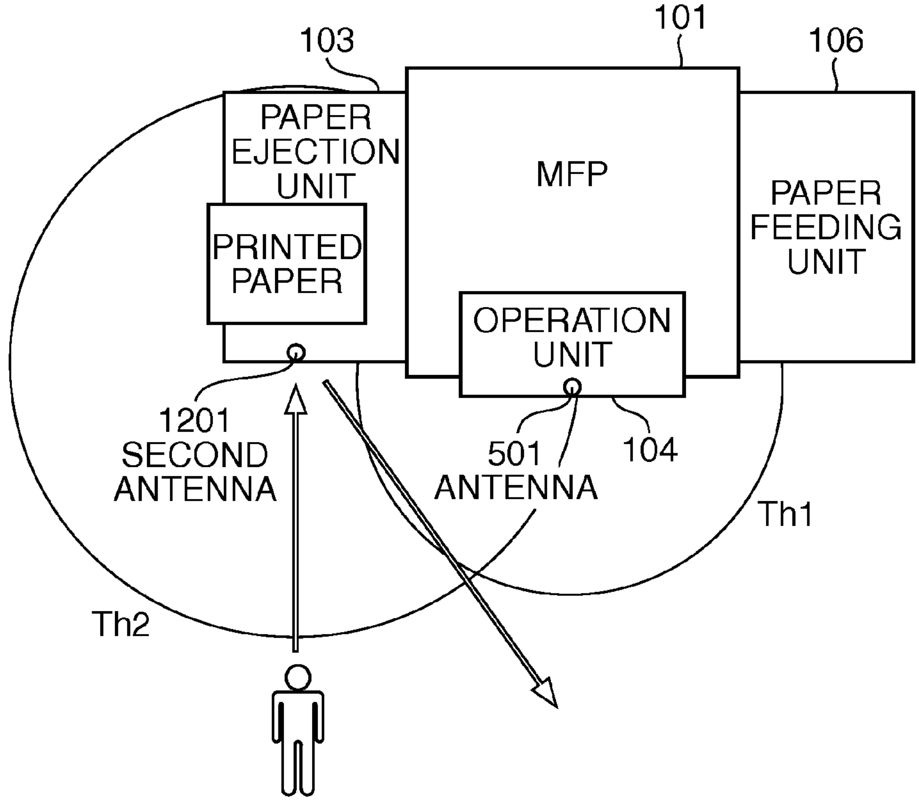

103
101
106
PAPER EJECTION UNIT
MFP
PAPER FEEDING UNIT
PRINTED PAPER
OPERATION UNIT
1201 SECOND ANTENNA
501 ANTENNA
104
Th1
Th2

FIG.14

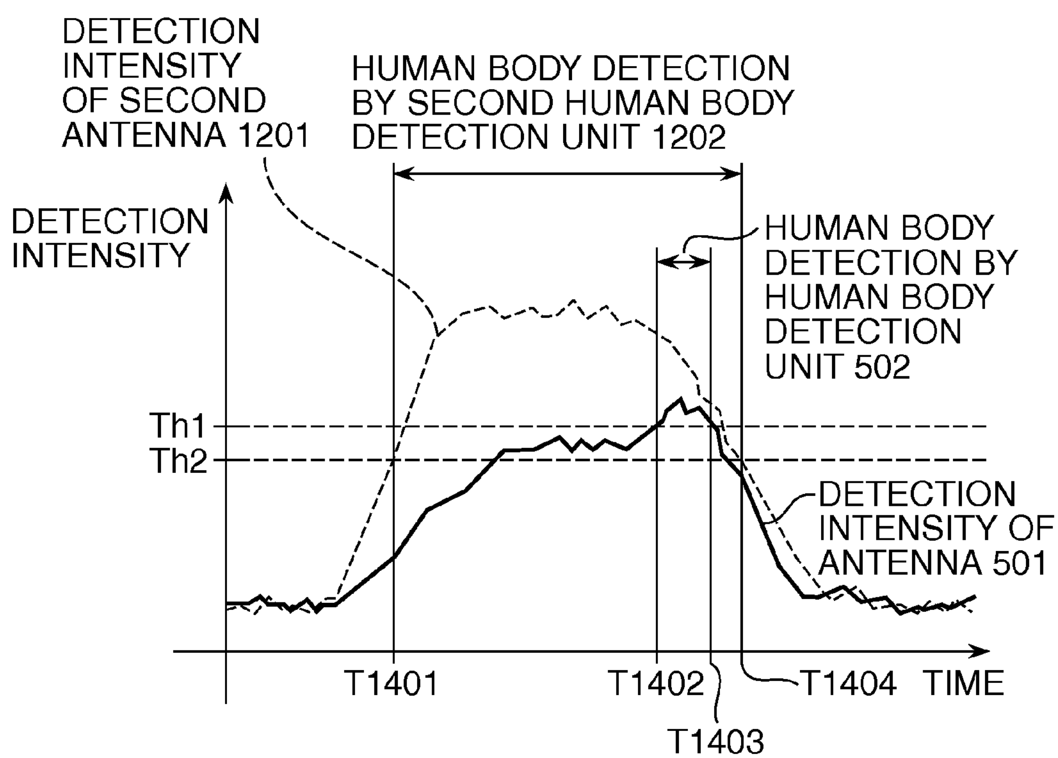

DETECTION INTENSITY OF SECOND ANTENNA 1201
HUMAN BODY DETECTION BY SECOND HUMAN BODY DETECTION UNIT 1202
DETECTION INTENSITY
HUMAN BODY DETECTION BY HUMAN BODY DETECTION UNIT 502
Th1
Th2
DETECTION INTENSITY OF ANTENNA 501
T1401
T1402
T1404
TIME
T1403

FIG.15

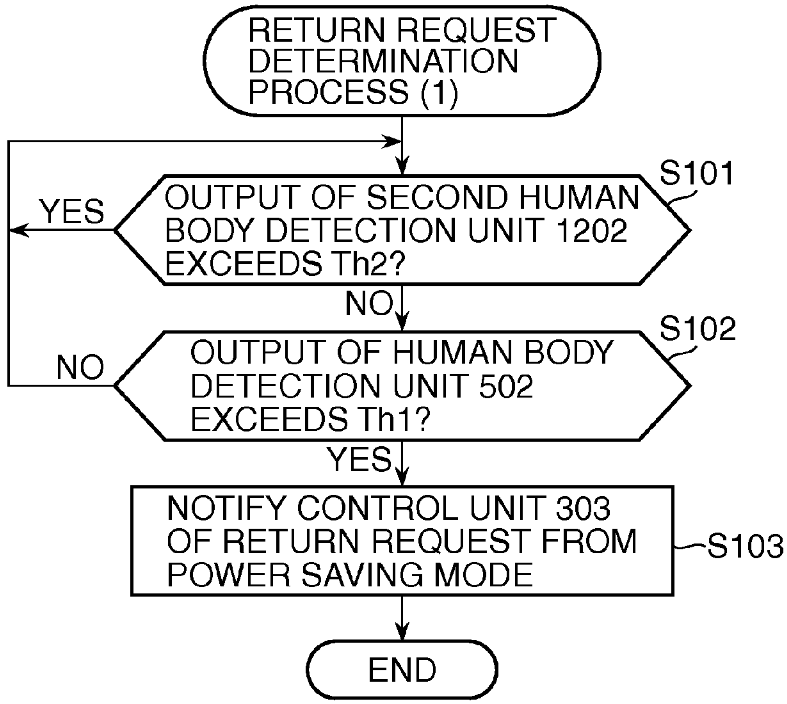

RETURN REQUEST DETERMINATION PROCESS (1)
OUTPUT OF SECOND HUMAN BODY DETECTION UNIT 1202 EXCEEDS Th2?
S101
YES
NO
OUTPUT OF HUMAN BODY DETECTION UNIT 502 EXCEEDS Th1?
S102
NO
YES
NOTIFY CONTROL UNIT 303 OF RETURN REQUEST FROM POWER SAVING MODE
S103
END

FIG.16

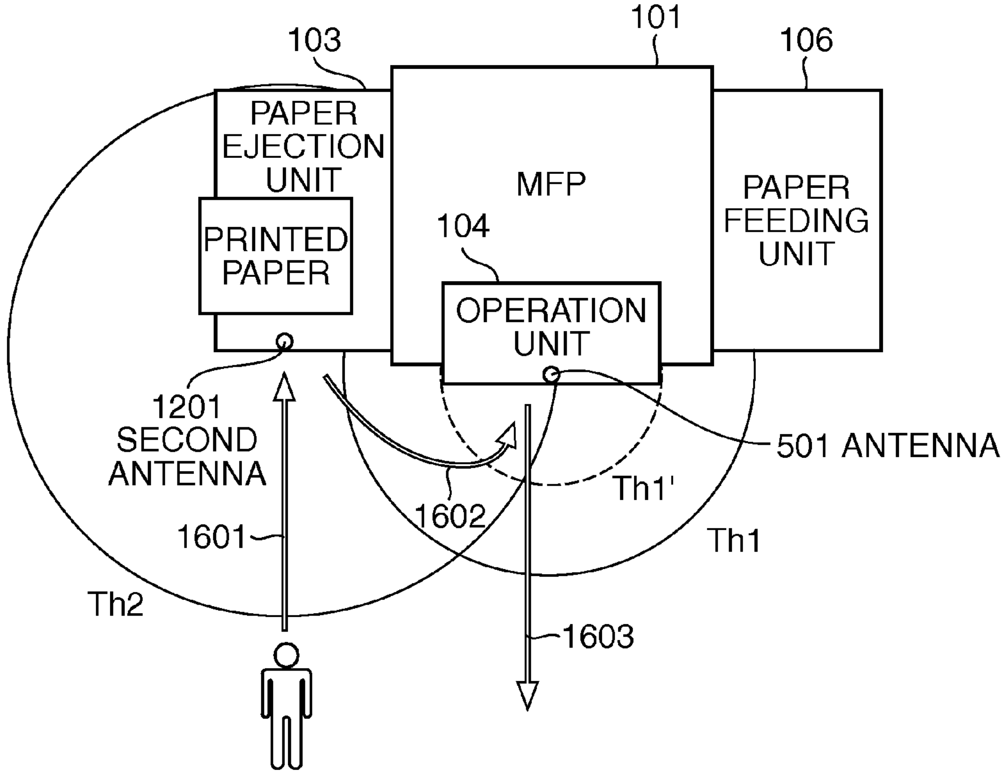

103
101
106
PAPER EJECTION UNIT
PRINTED PAPER
MFP
104
OPERATION UNIT
PAPER FEEDING UNIT
1201 SECOND ANTENNA
501 ANTENNA
Th1'
1602
Th1
1601
Th2
1603

FIG.17

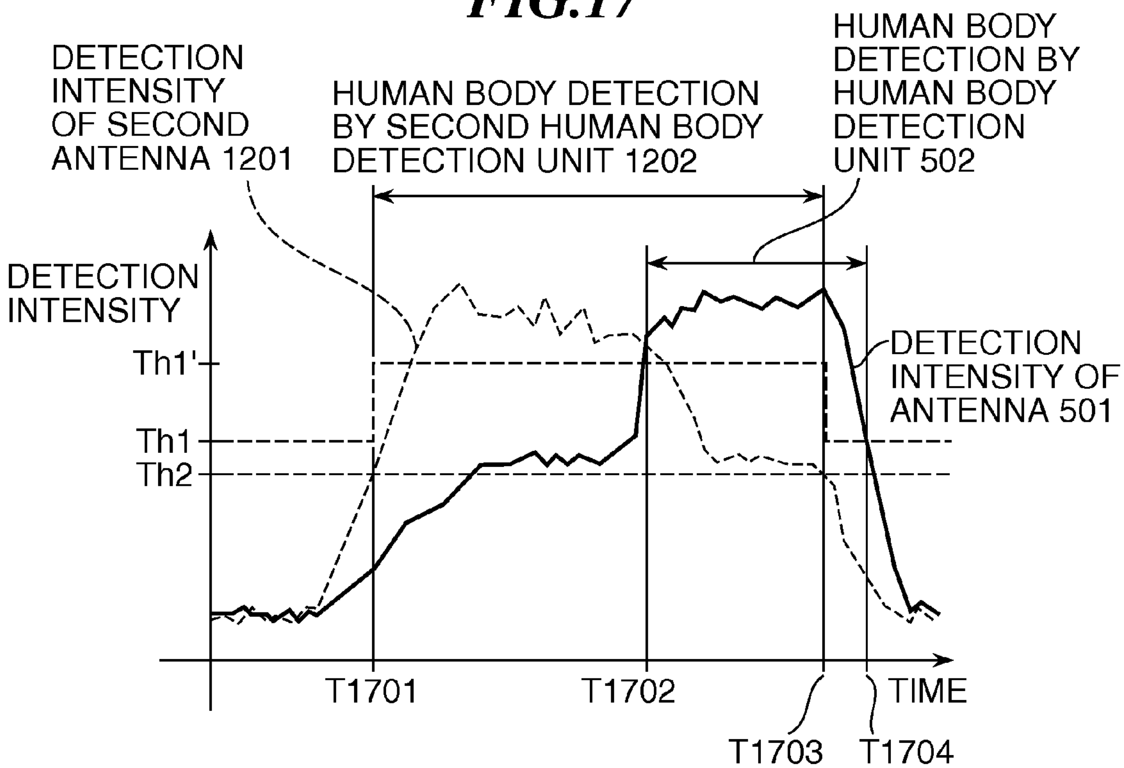

DETECTION INTENSITY OF SECOND ANTENNA 1201
HUMAN BODY DETECTION BY SECOND HUMAN BODY DETECTION UNIT 1202
HUMAN BODY DETECTION BY HUMAN BODY DETECTION UNIT 502
DETECTION INTENSITY
Th1'
Th1
Th2
DETECTION INTENSITY OF ANTENNA 501
T1701
T1702
TIME
T1703
T1704

FIG.18

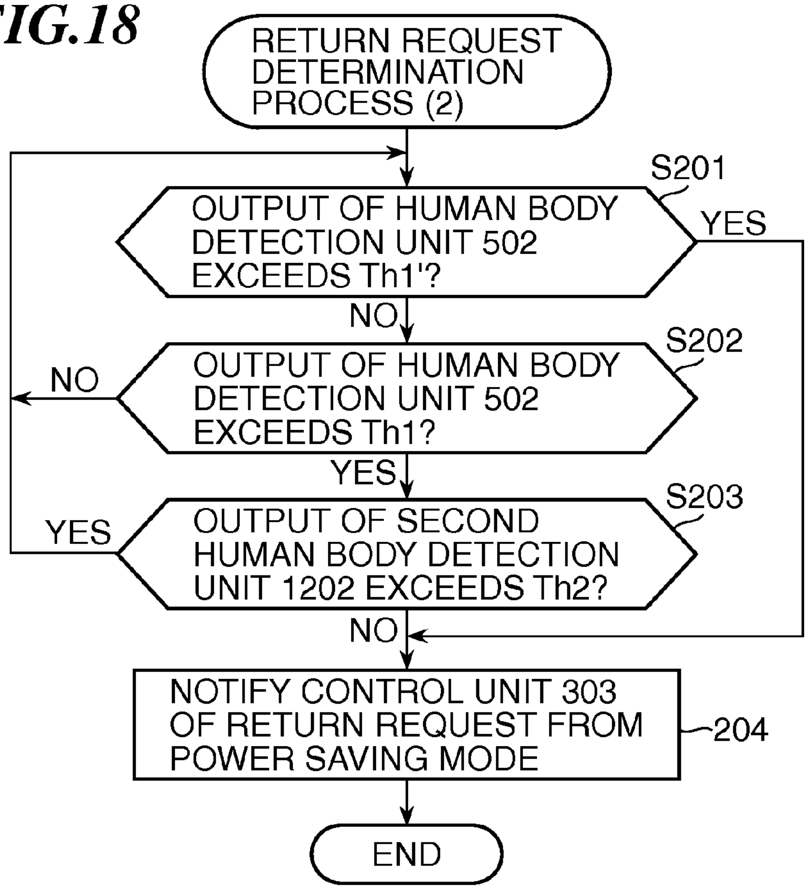

RETURN REQUEST DETERMINATION PROCESS (2)
S201
OUTPUT OF HUMAN BODY DETECTION UNIT 502 EXCEEDS Th1'?
YES
NO
S202
NO
OUTPUT OF HUMAN BODY DETECTION UNIT 502 EXCEEDS Th1?
YES
S203
YES
OUTPUT OF SECOND HUMAN BODY DETECTION UNIT 1202 EXCEEDS Th2?
NO
NOTIFY CONTROL UNIT 303 OF RETURN REQUEST FROM POWER SAVING MODE
204
END

FIG.19

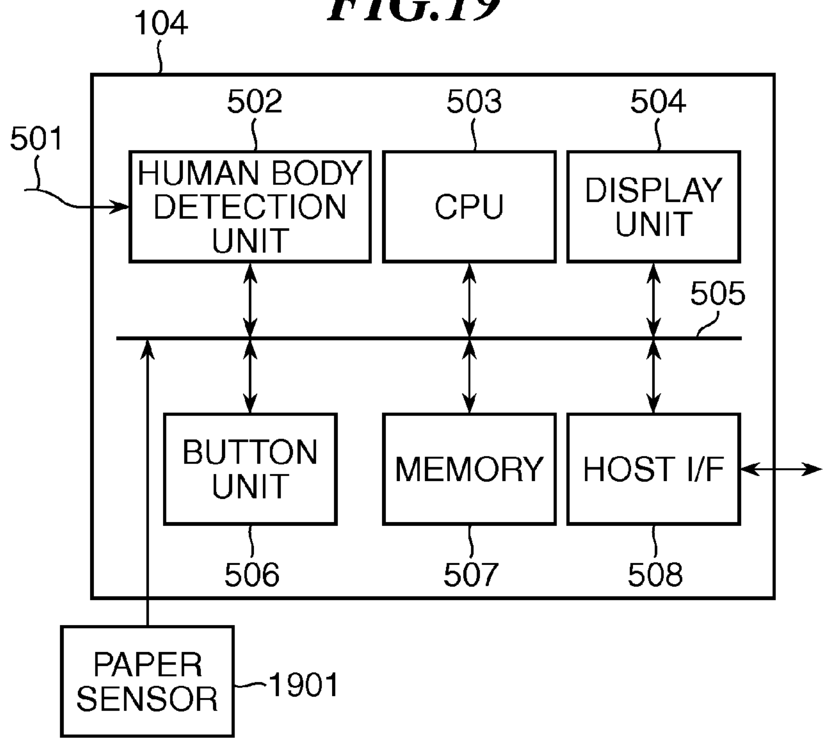

104
501
502
HUMAN BODY DETECTION UNIT
503
CPU
504
DISPLAY UNIT
505
BUTTON UNIT
MEMORY
HOST I/F
506
507
508
PAPER SENSOR
1901

FIG.20

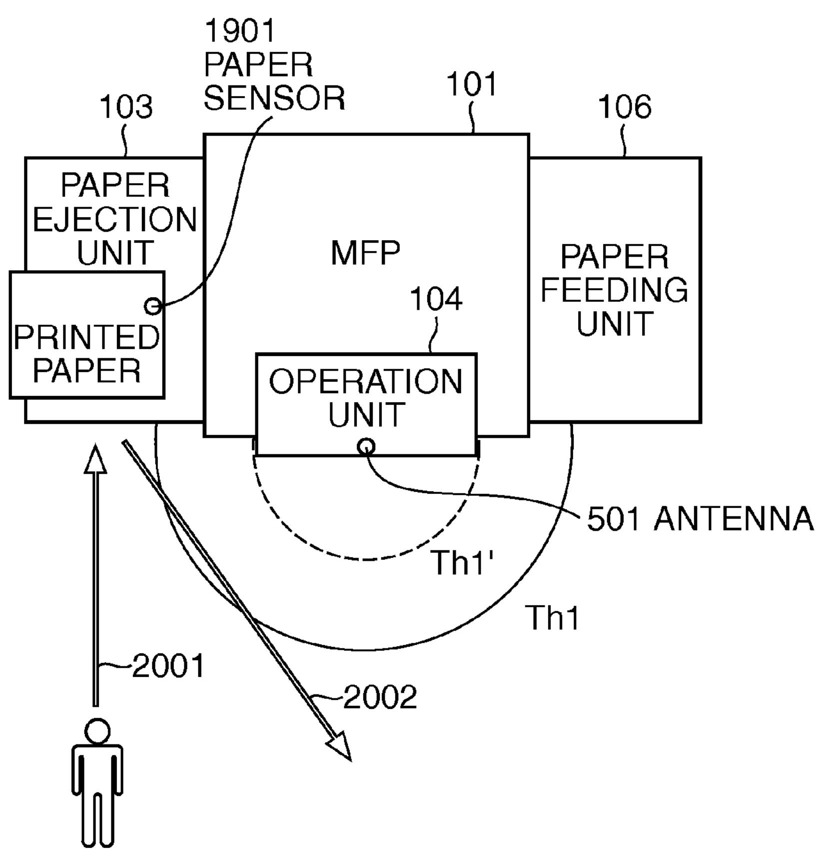

1901 PAPER SENSOR
103
101
106
PAPER EJECTION UNIT
MFP
PAPER FEEDING UNIT
104
PRINTED PAPER
OPERATION UNIT
501 ANTENNA
Th1'
Th1
2001
2002

FIG.21

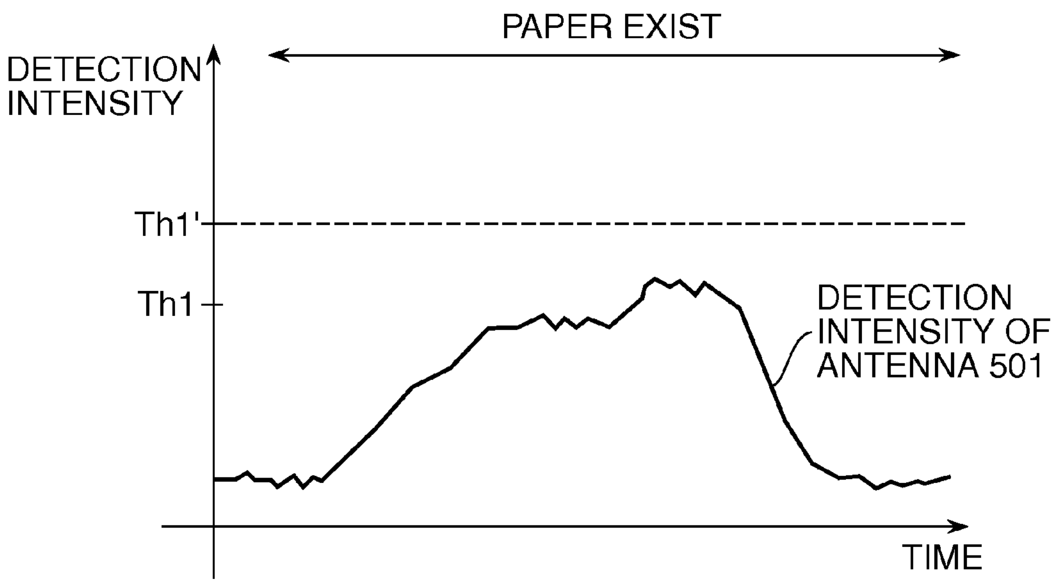

PAPER EXIST
DETECTION INTENSITY
Th1'
Th1
DETECTION INTENSITY OF ANTENNA 501
TIME

FIG.22

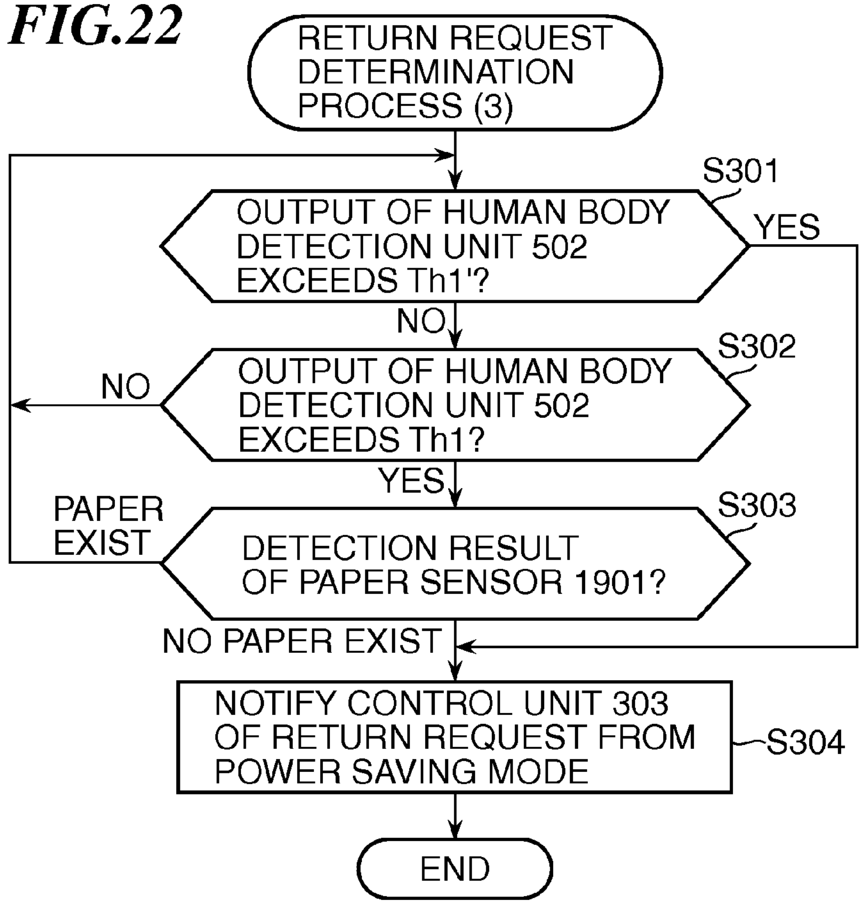

RETURN REQUEST DETERMINATION PROCESS (3)
S301
OUTPUT OF HUMAN BODY DETECTION UNIT 502 EXCEEDS Th1'?
YES
NO
S302
OUTPUT OF HUMAN BODY DETECTION UNIT 502 EXCEEDS Th1?
NO
YES
S303
PAPER EXIST
DETECTION RESULT OF PAPER SENSOR 1901?
NO PAPER EXIST
NOTIFY CONTROL UNIT 303 OF RETURN REQUEST FROM POWER SAVING MODE
S304
END

FIG.23

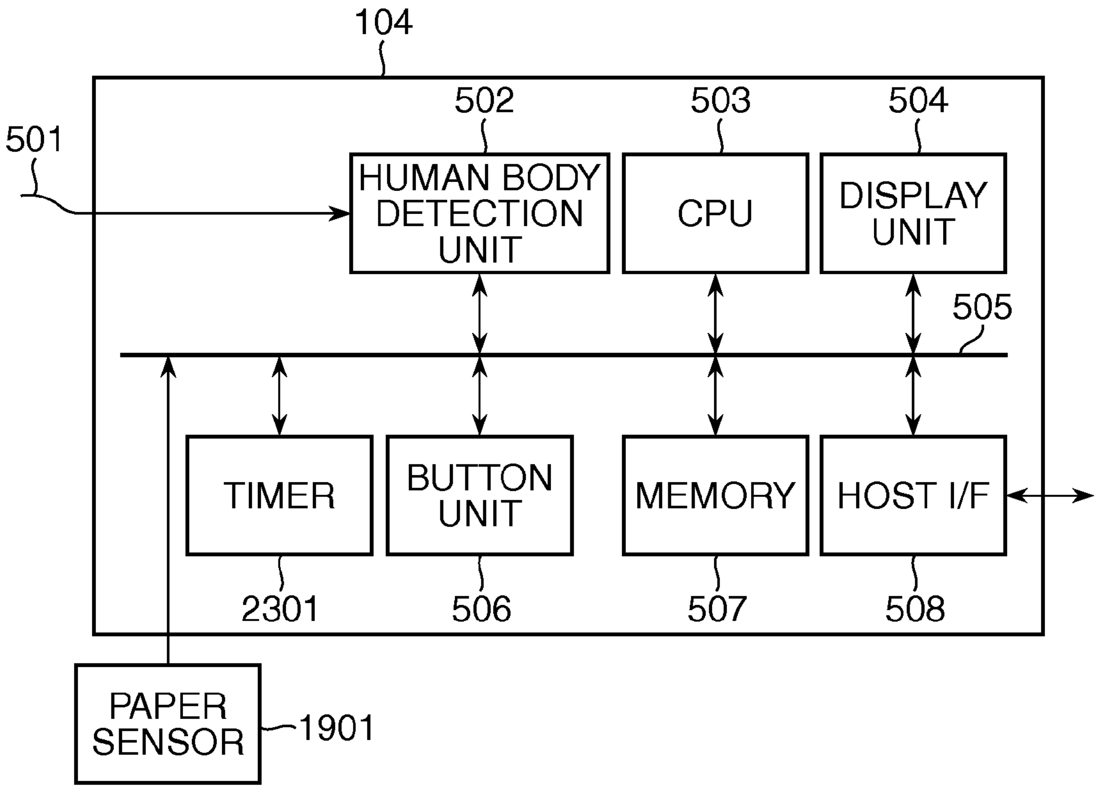

104
502
503
504
501
HUMAN BODY DETECTION UNIT
CPU
DISPLAY UNIT
505
TIMER
BUTTON UNIT
MEMORY
HOST I/F
2301
506
507
508
PAPER SENSOR
1901

FIG.24

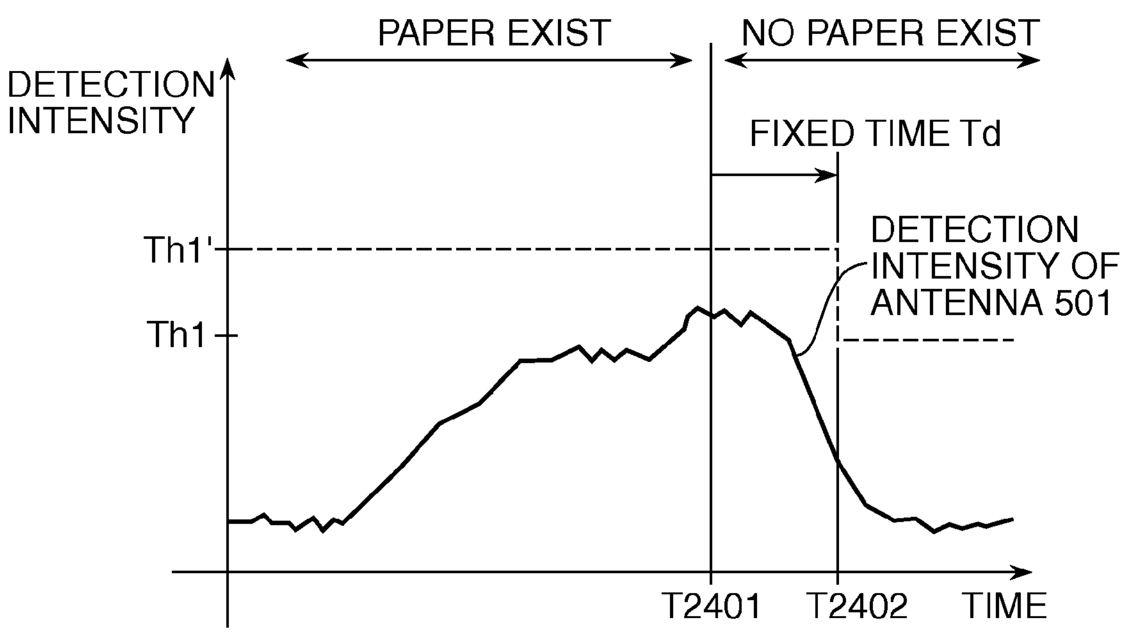

PAPER EXIST
NO PAPER EXIST
DETECTION INTENSITY
FIXED TIME Td
Th1'
DETECTION INTENSITY OF ANTENNA 501
Th1
T2401
T2402
TIME

FIG.25

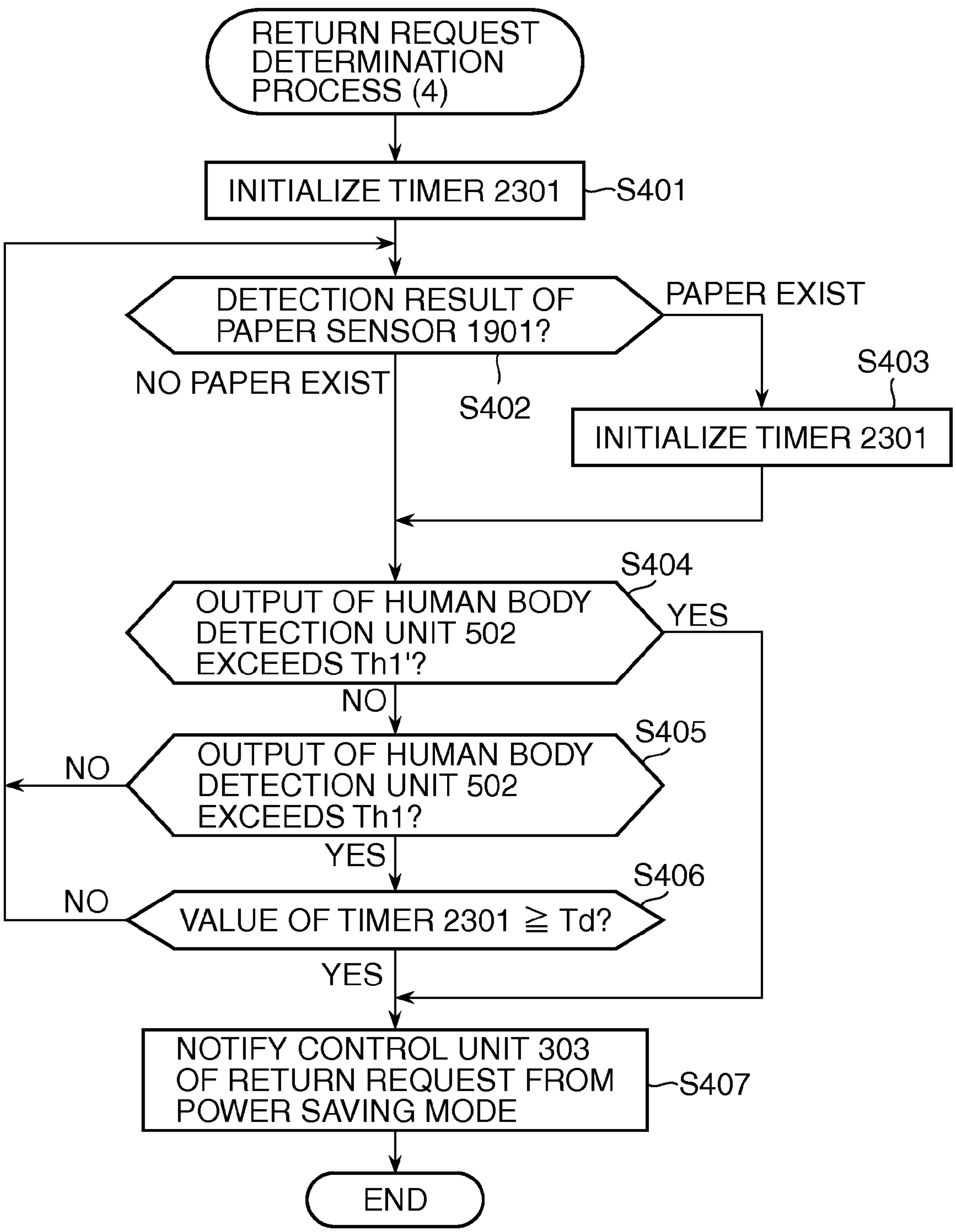

RETURN REQUEST DETERMINATION PROCESS (4)
INITIALIZE TIMER 2301
S401
DETECTION RESULT OF PAPER SENSOR 1901?
PAPER EXIST
S403
NO PAPER EXIST
S402
INITIALIZE TIMER 2301
S404
OUTPUT OF HUMAN BODY DETECTION UNIT 502 EXCEEDS Th1'?
YES
NO
S405
NO
OUTPUT OF HUMAN BODY DETECTION UNIT 502 EXCEEDS Th1?
YES
S406
NO
VALUE OF TIMER 2301 ≧ Td?
YES
NOTIFY CONTROL UNIT 303 OF RETURN REQUEST FROM POWER SAVING MODE
S407
END

IMAGE PROCESSING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an image processing apparatus (an image forming apparatus), and particularly relates to the image processing apparatus that is characterized in a human body (living body) detection technique for switching an electric power mode.

2. Description of the Related Art

A conventional image processing apparatus supports a power saving mode in which electric power supplied to almost all units inside the apparatus is cut in order to achieve power saving. Since a return to a normal mode from the power saving mode needs to turn on a power, time is taken, which may impair a user's convenience.

In order to solve the problem, some conventional image processing apparatuses that support the power saving mode are provided with a human body detection unit and return to the normal mode from the power saving mode when detecting a human body (for example, see Japanese laid-open patent publication (Kokai) No. H11-202690 (JP H11-202690A)). This has an effect to shorten an apparent starting time for a user.

In the technique disclosed in the above-mentioned publication, since the image processing apparatus returns to the normal mode whenever the user approaches the image processing apparatus, the apparatus uselessly returns to the normal mode even when it is unnecessary.

For example, it is necessary to return to the normal mode when the user operates an operation unit. However, it is unnecessary to return the image processing apparatus from the power saving mode when coming to pick up ejected paper to a paper ejection unit, when supplementing paper to a paper feeding unit, and when supplying toner. Unnecessary start-up of the image processing apparatus uselessly consumes lives of devices of which the numbers of times of start-up are limited.

For example, the devices of which lives are limited include a HDD, a relay that turns on/off electric power in an electric power source unit, a fuse used in the electric power source unit, etc. Moreover, unnecessary electric power is consumed until the once-started image processing apparatus shifts to the power saving mode again.

SUMMARY OF THE INVENTION

The present invention provides a image processing apparatus that can prolong lives of device parts of which lives are limited by preventing unnecessary returns from a power saving mode, and can reduce unnecessary power consumption.

Accordingly, a first aspect of the present invention provides an image processing apparatus that has a plurality of electric power modes including a first electric power mode and a second electric power mode that are different in conditions for supplying electric power inside the apparatus, the image processing apparatus comprising a switching unit adapted to operate in the first electric power mode and to switch the electric power mode when detecting a trigger, a first living body detection unit adapted to be arranged so as to detect a living body that approaches the apparatus to input the trigger, and a second living body detection unit adapted to be arranged so as to detect a living body that approaches the apparatus for a purpose other than the input of the trigger, wherein the switching unit switches the mode to the second electric power mode from the first electric power mode when the first living body detection unit detects the living body and when the second living body detection unit does not detect the living body, and wherein the switching unit maintains the first electric power mode when the first living body detection unit detects the living body and when the second living body detection unit detects the living body.

Accordingly, a second aspect of the present invention provides an image processing apparatus that has a plurality of electric power modes including a first electric power mode and a second electric power mode that are different in conditions for supplying electric power inside the apparatus, the image processing apparatus comprising a switching unit adapted to operate in the first electric power mode and to switch the electric power mode when detecting a trigger, a first living body detection unit adapted to be arranged so as to detect a living body that approaches the apparatus to input the trigger, and a second living body detection unit adapted to be arranged so as to detect a living body that approaches the apparatus for a purpose other than the input of the trigger, wherein the first living body detection unit defines first detection intensity that is detected when the living body approaches the apparatus at a predetermined distance, and second detection intensity that is detected when the living body approaches the apparatus at a distance shorter than the predetermined distance, wherein the switching unit switches the mode to the second electric power mode from the first electric power mode when the first living body detection unit detects the living body at the second detection intensity, wherein the switching unit switches the mode to the second electric power mode from the first electric power mode when the first living body detection unit detects the living body at the first detection intensity and when the second living body detection unit does not detect the living body, and wherein the switching unit maintains the first electric power mode when the first living body detection unit detects the living body at the first detection intensity and when the second living body detection unit detects the living body.

Accordingly, a third aspect of the present invention provides an image processing apparatus that has a plurality of electric power modes including a first electric power mode and a second electric power mode that are different in conditions for supplying electric power inside the apparatus, the image processing apparatus comprising a switching unit adapted to operate in the first electric power mode and to switch the electric power mode when detecting a trigger, a condition detection unit adapted to detect a specific condition of the apparatus, and a first living body detection unit adapted to be arranged so as to detect a living body that approaches the apparatus to input the trigger, wherein the first living body detection unit defines first detection intensity that is detected when the living body approaches the apparatus at a predetermined distance, and second detection intensity that is detected when the living body approaches the apparatus at a distance shorter than the predetermined distance, wherein the switching unit switches the mode to the second electric power mode from the first electric power mode when the first living body detection unit detects the living body at the second detection intensity, wherein the switching unit switches the mode to the second electric power mode from the first electric power mode when the first living body detection unit detects the living body at the first detection intensity and when the condition detection unit does not detect the specific condition, and wherein the switching unit maintains the first electric power mode when the first living body detection unit detects the living body at the first detection intensity and when the condition detection unit detects the specific condition.

According to the present invention, lives of the device parts of which lives are limited can be prolonged by preventing unnecessary returns from the power saving mode, and unnecessary power consumption can be reduced.

Further features of the present invention will become apparent from the following description of exemplary embodiments with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an external view showing an MFP as an image processing apparatus according to a first embodiment of the present invention.

FIG. **2** is an external view showing a large-size MFP as an image processing apparatus according to a second embodiment of the present invention.

FIG. **3** is a block diagram schematically showing a hardware configuration inside the MFP shown in FIG. **1**.

FIG. **4** is a block diagram schematically showing a configuration of a control unit in FIG. **3**.

FIG. **5** is a block diagram schematically showing an configuration of an operation unit in FIG. **3**.

FIG. **6** is a view showing an operating principle of human body detection by a human body detection unit by an electrostatic capacity method in FIG. **5**.

FIG. **7** is a block diagram schematically showing a configuration of the human body detection unit in FIG. **5**.

FIG. **8** is a top view of the MFP having an antenna on the operation unit in which a locus of a user who came to operate the operation unit is entered.

FIG. **9** is a graph showing a relation between detection intensity of an electrostatic capacity detection circuit in FIG. **7** and time with respect to the locus of the user in FIG. **8**.

FIG. **10** is a top view showing the MFP having the antenna on the operation unit in which a locus of a user who came to pick up paper to a paper ejection unit of the MFP is entered.

FIG. **11** is a graph showing a relation between detection intensity of the electrostatic capacity detection circuit in FIG. **7** and time with respect to the locus of the user in FIG. **10**.

FIG. **12** is a block diagram schematically showing a configuration in which a second human body detection unit is connected to the operation unit in FIG. **3**.

FIG. **13** is a top view showing the MFP having the antenna on the operation unit and a second antenna on the paper ejection unit in which the locus of the user who came to pick up paper to the paper ejection unit is entered.

FIG. **14** is a graph showing a relation between detection intensity of the electrostatic capacity detection circuit in FIG. **7** and time with respect to the locus of the user in FIG. **13**.

FIG. **15** is a flowchart showing a process to determine whether a return request for returning from a power saving mode executed by a CPU in FIG. **12** is outputted or not (a return request determination process).

FIG. **16** is a top view showing the MFP having the antenna on the operation unit and the second antenna on the paper ejection unit in which the locus of the user who used the operation unit after coming to pick up paper to the paper ejection unit, and then left the MFP is entered.

FIG. **17** is a graph showing a relation between detection intensity of the electrostatic capacity detection circuit in FIG. **7** and time with respect to the locus of the user in FIG. **16**.

FIG. **18** is a flowchart showing a process to determine whether the return request for returning from the power saving mode executed by the CPU in FIG. **12** is outputted or not (the return request determination process).

FIG. **19** is a block diagram showing the configuration in which a paper sensor is connected to the operation unit in FIG. **3**.

FIG. **20** is a top view showing the MFP having the antenna on the operation unit and the paper sensor on the paper ejection unit in which the locus of the user who came to pick up paper to the paper ejection unit is entered.

FIG. **21** is a graph showing a relation between detection intensity of the electrostatic capacity detection circuit in FIG. **7** and time with respect to the locus of the user in FIG. **20**.

FIG. **22** is a flowchart showing a process to determine whether the return request for returning from the power saving mode executed by the CPU in FIG. **19** is outputted or not (the return request determination process).

FIG. **23** is a block diagram schematically showing a configuration in which a timer is added to the operation unit in FIG. **3**.

FIG. **24** is a graph showing a relation between detection intensity of an electrostatic capacity detection circuit in FIG. **7** and time with respect to the locus of the user in FIG. **20**.

FIG. **25** is a flowchart showing a process to determine whether the return request for returning from the power saving mode executed by the CPU in FIG. **23** is outputted or not (the return request determination process).

DESCRIPTION OF THE EMBODIMENTS

Hereafter, embodiments according to the present invention will be described in detail with reference to the drawings.

FIG. **1** is an external view showing an MFP **101** as an image processing apparatus according to a first embodiment of the present invention.

The MFP (multifunction peripheral device) **101** has functions such as a copy, a scanner, a facsimile, and a printer, and has a plurality of electric power modes including a first electric power mode (a power saving mode) and a second electric power mode (a normal mode), which are different in a condition of an electric power supply inside the device.

A reader unit **102** is a position on which a user puts a paper original, reads the paper original by a sensor, and outputs electronic data. An operation unit **104** consists of buttons that are used by a user to give instructions to the device and a display device that displays a condition of the device and an operation menu.

A printer unit **105** prints a desired image on paper by forming a toner image on the paper fed from a paper feeding unit **106** and fixing the toner image. The printed paper is ejected by a paper ejection unit **103**. The paper feeding unit **106** holds the paper. The user can add paper to the paper feeding unit **106**.

FIG. **2** is an external view showing a large-size MFP **201** as an image processing apparatus according to a second embodiment of the present invention.

Since the large-size MFP **201** is ready for a high speed printing and a continuous large number printing, an external shape of the MFP **201** is larger than the normal MFP **101**. Particularly, a printer unit **205**, a paper feeding unit **206**, a paper ejection unit **203**, and an operation unit **204** are large-sized. A reader unit **202** also achieves a higher operation speed. A toner supplying unit **207** is arranged at a position that is easy to supply toner in order to achieve a high-speed continuous operation of the large-size MFP **201**.

The user mainly approaches the MFP **101** and the large-size MFP **201** when operating the operation unit, when picking up ejected paper, when adding paper, and when supplying the toner. When using the large-size MFP **201**, standing points of the user are different largely according to operations performed by the user, as compared with the MFP **101**.

FIG. **3** is a block diagram schematically showing a hardware configuration inside the MFP **101** shown in FIG. **1**.

Although FIG. **3** shows the hardware configuration inside the MFP **101** of FIG. **1**, it is assumed that the large-size MFP **201** of FIG. **2** also has the inside configuration as shown in FIG. **3**.

A plug **301** is inserted into a plug socket of commercial alternating current electric power source and supplies AC electric power to an electric power source unit **302**. The electric power source unit **302** supplies electric power to each unit in the device. That is, the electric power source unit **302** converts the alternating current electric power into a voltage suitable for each unit, and converts the alternating current into a direct current if needed. A control unit **303** controls other units, processes electronic data and transmits the same.

An electric power source control signal **304** is for controlling On/Off of an output of the electric power source unit **302** by the control unit **303**. The MFP **101** has the normal mode of an operation and the power saving mode that reduces electric power consumption significantly.

In the power saving mode, in order to reduce the electric power consumption, the electric power for the reader unit **102**, the paper ejection unit **103**, the printer unit **105**, and the paper feeding unit **106** is disconnected. Interiors of the control unit **303** and the operation unit **104** operate partially, and the electric power for the other parts thereof is disconnected. The electric power is supplied to only a circuit that detects a trigger to return to the normal mode from the power saving mode.

The triggers are a reception of a facsimile, a reception of a job via a network, a depression of a button of the operation unit **104**, etc. In the power saving mode, it is desirable that the user who depresses the button of the operation unit **104** can use the operation unit **104** as soon as possible.

However, the retuning may require several seconds through several tens of seconds depending on software and hardware that control the operation unit **104**. For example, a relay that turns On/Off electric power, a HDD, etc. have lives (several tens of thousands of times in a few example). For example, a life of the relay is a life of a contact, and a life of the HDD is determined by accumulation of mechanical stresses to a storage medium and a head.

Therefore, the number of times for switching between the power saving mode and the normal mode has a limit. Accordingly, it is desirable that the number of times for switching is minimized.

FIG. **4** is a block diagram schematically showing a configuration of the control unit **303** in FIG. **3**.

In FIG. **4**, a CPU **402** executes a process of the control unit **303** and uses a memory **403**.

A reader I/F **404** is an interface for communicating with the reader unit **102**. An internal bus **405** is used in order that the CPU **402** communicates with each block in the control unit **303**. An operation unit I/F **406** is an interface for communicating with the operation unit **104**, transmits display data, and receives information inputted by a user through buttons, a touch panel, etc.

A LAN I/F **407** is connected to a network such as the Ethernet (registered trademark), and transfers and receives job data, a command, and status. A FAX I/F **408** is an interface that is connected to a public telephone line and performs communications of FAX images.

An HDD **409** stores programs and an OS that are used by the CPU **402**. The HDD **409** stores job data and image data as files. The job data is used by the MFP to execute functions and is PDL (Page Description Language) data for a printing process received via the LAN I/F **407** from a client PC (not shown), for example. A printer I/F **410** is an interface to communicate with the printer unit **105**, and transfers and receives a command, status, and image data.

An electric power source control unit **401** is a block that controls a shift of the mode of the MFP between the normal rode and the power saving mode. The electric power source control unit **401** varies the electric power source control signal **304** to shift to the power saving mode from the normal mode according to a command from the CPU **402**.

The electric power source control unit **401** functions as a switching unit that can operate in a first electric power mode (the power saving mode) and switches an electric power mode when detecting a trigger.

In the power saving mode, the electric power source control unit **401** monitors start-up signals from the operation unit I/F **406**, the LAN I/F **407**, and the FAX I/F **408**, and varies the electric power source control signal **304** so as to return to the normal mode from the power saving mode when detecting a variation.

FIG. **5** is a block diagram schematically showing an configuration of the operation unit **104** in FIG. **3**.

In FIG. **5**, a human body detection unit (a first living body detection unit) **502** and an antenna **501** are a block that performs human body detection by an electrostatic capacity method, determines an approach and leaving of the user, and transmits a result to the control unit **303** via a host I/F **508**.

A CPU **503** controls the operation unit **104** and uses a memory **507** for an operation. The memory **507** consists of a nonvolatile program memory and a rewritable temporary memory.

A display unit **504** displays data received from the control unit **303** via the host I/F **508** onto an LCD. A button unit **506** consists of push buttons, a touch panel overlaid on the LCD, etc. When detecting variation of the buttons or the touch panel, the CPU **503** transmits the variation of the buttons or the touch panel to the control unit **303** via the host I/F **508**.

Blocks in the operation unit **104** are connected via an internal bus **505**. In the power saving mode, the electric power is supplied to a part of the human body detection unit **502** and a part of the host I/F **508** in order to reduce the electric power consumption.

It should be noted that although the embodiment shows the configuration in which the human body detection unit **502** is equipped in the operation unit **104**, the human body detection unit **502** may be connected with the internal bus **405**. Although the embodiment shows the configuration in which the CPU **503** and the memory **507** are equipped in the operation unit **104**, the CPU **402** may control the operation unit **104** and the operation unit **104** may have no CPU and no memory.

As mentioned above, when the user returns the MFP from the power saving mode by a button operation, it is desirable to return as soon as possible. Since the human body detection unit is equipped in the MFP, the MFP returns to the normal mode when detecting an approach of the user, which can obtain an effect that shortens an apparent recovery time.

FIG. **6** is a view showing an operating principle of the human body detection by the human body detection unit **502** by the electrostatic capacity method in FIG. **5**.

On an occasion of the human body detection by the electrostatic capacity method, an electrostatic capacity Chm between the antenna **501** equipped to the MFP **101** and a human body **601** is measured. The electrostatic capacity Chm varies with a distance between the antenna **501** and the human body **601**. However, the electrostatic capacity that can be measured by the antenna **501** actually is a synthetic capacity

C that is a sum of an electrostatic capacity Chg between the human body **601** and the ground, an electrostatic capacity Cmg between the MFP **101** and the ground, in addition to the electrostatic capacity Chm. The synthetic capacity C is defined by a formula 1.

$$C=(Chm+Chg)/Cmg \quad \text{(Formula 1)}$$

Since the electrostatic capacities Chg and Cmg vary with an environment, the MFP determines whether the human body **601** approaches the MFP **101** or not on the basis of a relative value with respect to a basic noise level. A feature of the human body detection by the electrostatic capacity method is a point that can grasp the distance between the human body **601** and the MFP **101** relatively as shown by the formula 1. Since power consumption is also low, it is suitable for an operation in the power saving mode.

FIG. **7** is a block diagram schematically showing a configuration of the human body detection unit **502** in FIG. **5**.

In FIG. **7**, an electrostatic capacity detection circuit **701** comprises a CV conversion unit **707**, an A/D conversion unit **708**, and a control unit **709**. The CV conversion unit **707** to which the antenna **501** is connected converts electrostatic capacity between the antenna **501** and the ground into a voltage value. The voltage value outputted from the CV conversion unit **707** is converted into a digital value by the A/D conversion unit **708**.

According to commands issued from a CPU **702**, the control unit **709** controls the CV conversion unit **707** and the A/D conversion unit **708**. The CPU **702** reads the acquired digital value and operates for a noise rejection, a level conversion, etc. A memory **704** consists of a nonvolatile program memory and a rewritable temporary memory.

Blocks in the human body detection unit **502** are connected via an internal bus **703**. A buffer **706** connects the internal bus **703** of the human body detection unit **502** with the internal bus **505** of the operation unit **104**.

FIG. **8** is a top view showing the MFP **101** having the antenna **501** on the operation unit **104** in which a locus of the user who came to operate the operation unit **104** is entered.

In FIG. **8**, a reference sign Th**1** is a threshold value for detecting the human body by the human body detection unit **502**. When the human body is in a circle shown by the threshold value Th**1**, it is determined that the human body is detected. Since there is no directivity in the human body detection by the electrostatic capacity method, the threshold value Th**1** is shown as a circle.

The reason why the antenna **501** is arranged on the operation unit **104** is because a return button that the user pushes to shift from the power saving mode to the normal mode is arranged on the operation unit **104**. The antenna **501** may be arranged on another position as long as the user who approaches to the operation unit **104** is detectable.

FIG. **9** is a graph showing a relation between detection intensity of the electrostatic capacity detection circuit **701** in FIG. **7** and time with respect to the locus of the user in FIG. **8**.

In FIG. **9**, since the user is apart from the MFP **101** in a period from an origin in the graph to T**901**, the detection intensity is in the noise level. The detection intensity gradually increases from T**901**, and it is determined that the human body is detected when the detection intensity exceeds the threshold value Th**1**. When the detection intensity becomes smaller than the threshold value Th**1** at T**903**, it is determined that the user leaves from the MFP **101**.

The above description is a general operation example of the MFP that is equipped with the human body detection unit **502** by the electrostatic capacity method. Accordingly, since the MFP can start before the user pushes the button to return from the power saving mode to the normal mode, which improves convenience to the user.

As mentioned above, the user may approach the MFP for a purpose other than operations of the operation unit **104**. For example, the user may come to pick up ejected paper from the paper ejection unit **103**.

FIG. **10** is a top view showing the MFP **101** having the antenna **501** on the operation unit **104** in which a locus of the user who came to pick up the paper to the paper ejection unit **103** of the MFP **101** is entered.

In FIG. **10**, the user approaches the paper ejection unit **103** (arrow **1001**) to pick up the ejected paper, and walks across the area in which the intensity detected by the electrostatic capacity detection circuit **701** exceeds the threshold value Th**1**, after the user picked up the ejected paper (arrow **1002**).

FIG. **11** is a graph showing a relation between detection intensity of the electrostatic capacity detection circuit **701** in FIG. **7** and time with respect to the locus of the user in FIG. **10**.

In FIG. **11**, since the detection intensity exceeds the threshold value Th**1** in a period from T**1201** to T**1202**, if the returning is determined only based on the threshold value, the MFP **101** returns from the power saving mode to the normal mode in spite of the fact that it is unnecessary to return actually. This embodiment proposes a technique of reducing a possibility to return from the power saving mode to the normal mode in such an unnecessary case.

In the first embodiment, an example in which the human body is detected at the operation unit **104** and the paper ejection unit **103** will be described. The reason is to distinguish a user who approaches to operate the operation unit **104** and a user who approaches to pick up the paper ejected to the paper ejection unit **103**.

In the first embodiment, the MFP may be the MFP **101** or may be the large-size MFP **201**. The device configuration of the MFP is identical to that described with reference to FIG. **1** through FIG. **4**.

FIG. **12** is a block diagram schematically showing a configuration in which a second human body detection unit **1202** (a second living body detection unit) is connected to the operation unit **104** in FIG. **3**.

The second human body detection unit **1202** and a second antenna **1201** are added to the configuration of the operation unit **104** shown in FIG. **5**. The CPU **503** detects the user who approaches to operate the operation unit **104** according to detection results of the human body detection unit **502** and the second human body detection unit **1202**. Since the configuration of the second human body detection unit **1202** is similar to the configuration of the human body detection unit **502** mentioned above, a description for the second human body detection unit **1202** is omitted.

In order to input a trigger from operation unit (operation panel) **104**, the human body detection unit **502** (the first living body detection unit) is arranged so that a human body close to an apparatus may be detected. The second human body detection unit **1202** is arranged so as to detect a human body that approaches the device for a purpose other than the input of the trigger.

FIG. **13** is a top view showing the MFP **101** having the antenna **501** on the operation unit **104** and the second antenna **1201** on the paper ejection unit **103** in which the locus of the user who came to pick up the paper to the paper ejection unit **103** is entered.

FIG. **14** is a graph showing a relation between detection intensity of the electrostatic capacity detection circuit **701** in FIG. **7** and time with respect to the locus of the user in FIG. **13**.

Since the detection intensity of the second human body detection unit **1202** exceeds a threshold value Th**2** in a period from T**1401** to T**1404**, it is determined that the human body is detected. Since the detection intensity of the human body detection unit **502** exceeds the threshold value Th**1** in a period from T**1402** to T**1403**, the human body is detected.

The CPU **503** of the operation unit **104** determines whether the MFP returns from the power saving mode or not. When the output of the second human body detection unit **1202** is lower than the threshold value Th**2** and the output of the human body detection unit **502** is higher than the threshold value Th**1**, the CPU **503** determines to return from the power saving mode.

That is, when the human body is detected near the paper ejection unit **103**, the power saving mode is maintained. On the other hand, when the human body is not detected near the paper ejection unit **103**, but is detected near the operation unit **104**, the MFP returns from the power saving mode.

This can prevent that the MFP returns from the power saving mode by the approach of the user who comes to pick up the paper from the paper ejection unit **103**.

FIG. **15** is a flowchart showing a process to determine whether a return request for returning from the power saving mode executed by the CPU **503** in FIG. **12** is outputted or not (a return request determination process). A reference sign S is attached to each process step.

After the MFP **101** shifts to the power saving mode, the CPU **503** of the operation unit **104** starts this flowchart.

After shifting to the power saving mode, in S**101**, the CPU **503** determines whether the output of the second human body detection unit **1202** exceeds the threshold value Th**2** or not. When exceeded, the CPU **503** determines that a return condition from the power saving mode is not satisfied, and performs the process from S**101** again. When not exceeded, in S**102**, the CPU **503** determines whether the output of the human body detection unit **502** exceeds the threshold value Th**1** or not.

When not exceeded, the CPU **503** determines that the return condition from the power saving mode is not satisfied, and performs the process from the S**101**. When exceeded, in S**103**, the CPU **503** notifies the control unit **303** of the return request for returning from the power saving mode. The control unit **303** shifts the mode of the MFP to the normal mode from the power saving mode by changing the electric power source control signal **304**.

As mentioned above, since the second antenna **1201** is added to the paper ejection unit **103** to combine with the antenna **501** equipped on the operation unit **104**, it can reduce the possibility of returning from the power saving mode due to detection of the user who comes to pick up paper that is outputted to the paper ejection unit **103**.

Although the second antenna **1201** is arranged on the paper ejection unit **103** in this embodiment, it may be arranged on the paper feeding unit **106** or other positions. For example, when the second antenna **1201** is arranged on the paper feeding unit **106**, the user who approaches the MFP **101** for the purpose of supplementing paper to the paper feeding unit **106** can be detected. In this case, the similar control as mentioned above can reduce the possibility of returning from the power saving mode due to detection of the user who comes to supplements paper.

In a second embodiment, an example in which the threshold value Th**1** for detecting the human body in the human body detection unit **502** varies in two steps is described.

In the configuration described in the first embodiment, when a user forms a locus to approach the operation unit **104** after the user goes to the paper ejection unit **103** to pick up paper, the CPU **503** cannot output the return request for returning from the power saving mode quickly to the control unit **303**. The second embodiment solves the above-mentioned disadvantage of the first embodiment.

For example, when a user checks the paper ejection unit **103** and does not find desired output paper, the user approaches the operation unit **104** to check the condition after approaching the paper ejection unit **103**. Since the configuration of the device is similar to that of the first embodiment, the description of the configuration of the second embodiment is omitted.

FIG. **16** is a top view showing the MFP **101** having the antenna **501** on the operation unit **104** and the second antenna **1201** on the paper ejection unit **103** in which a locus of a user who used the operation unit **104** after coming to pick up paper to the paper ejection unit **103**, and then left the MFP **101** is entered.

Arrows **1601**, **1602**, and **1603** show user's moving loci. If an area in which the human body detection intensity of the second human body detection unit **1202** exceeds the threshold value Th**2** includes the operation unit **104**, the configuration of the first embodiment does not output a return request for returning from the power saving mode even if the user approaches the operation unit **104**. According to the second embodiment, the human body detection intensity in the human body detection unit **502** is determined based on two steps of the threshold values Th**1** (a first detection intensity) and Th**1'** (a second detection intensity).

FIG. **17** is a graph showing a relation between detection intensity of the electrostatic capacity detection circuit **701** in FIG. **7** and time with respect to the locus of the user in FIG. **16**.

In FIG. **17**, a period from T**1701** to T**1703** is a period during which the second human body detection unit **1202** detects a human body. In this period, the human body detection intensity of the human body detection unit **502** equipped on the operation unit **104** is changed to the threshold value Th**1'**.

A period from T**1702** to T**1704** is a period during which the human body detection intensity of the human body detection unit **502** exceeds the threshold value. The CPU **503** of the operation unit **104** outputs a return request for returning from the power saving mode to the control unit **303** at the time of T**1702**.

FIG. **18** is a flowchart showing a process to determine whether a return request for returning from the power saving mode executed by the CPU **503** in FIG. **12** is outputted or not (a return request determination process). A reference sign S is attached to each process step.

After the MFP **101** shifts to the power saving mode, the CPU **503** of the operation unit **104** starts this flowchart.

After shifting to the power saving mode from the normal mode, in S**201**, the CPU **503** determines whether an output of the human body detection unit **502** exceeds the threshold value Th**1'** or not. When exceeded, the CPU **503** determines that a return condition from the power saving mode is satisfied, and notifies the control unit **303** of a return request for returning from the power saving mode in S**204**. When not exceeded, in S**202**, the CPU **503** determines whether the output of the human body detection unit **502** exceeds the threshold value Th**1**.

When not exceeded, the CPU **503** determines that the return condition from the power saving mode is not satisfied, and performs the process from the S**201** again. When exceeded, in S**203**, the CPU **503** determines whether an output of the second human body detection unit **1202** exceeds the threshold value Th**2** or not.

When exceeded, the CPU **503** determines that the return condition from the power saving mode is not satisfied, and performs the process from the S**201** again. When not exceeded, in S**204**, the CPU **503** notifies the control unit **303** of the return request from the power saving mode to the normal mode.

As described above, Th**1'** that is higher than Th**1** is set as the threshold value for the detection intensity, and when the output of the human body detection unit **502** exceeds Th**1'** (i.e., when the user approaches the operation unit **104** sufficiently), the return request for returning from the power saving mode to the normal mode can be outputted. When the output of the human body detection unit **502** exceeds Th**1**, and when the output of the second human body detection unit **1202** is lower than Th**2** (i.e., even when the user moves to the operation unit **104** from the paper ejection unit **103**), the return request for returning from the power saving mode to the normal mode can be outputted.

In a third embodiment, an example in which a sensor to detect ejected paper to the paper ejection unit **103** is used instead of the second human body detection unit **1202** described in the first embodiment is described. This embodiment uses a fact that a possibility that the user comes to the paper ejection unit **103** becomes low when the paper is not ejected. Since a cost of the paper sensor is cheaper than that of the human body detection unit, the third embodiment has an advantage that achieves lower cost as compared with the second embodiment.

FIG. **19** is a block diagram showing the configuration in which the paper sensor **1901** is connected to the operation unit **104** in FIG. **3**.

The paper sensor **1901** is used instead of the second human body detection unit **1202** in FIG. **12**. The CPU **503** reads a value that the paper sensor **1901** outputs, and determines whether there is paper ejected to the paper ejection unit **103** or not.

Here, the paper sensor **1901** functions as a condition detection unit that detects a specific condition of the device.

FIG. **20** is a top view of the MFP **101** having the antenna **501** on the operation unit **104** and the paper sensor **1901** on the paper ejection unit **103** in which a locus of a user who came to pick up the paper to the paper ejection unit **103** is entered.

When the paper sensor **1901** is detecting paper, there is a possibility that a user comes to the paper ejection unit **103** to pick up the paper. Therefore, the human body detection unit **502** narrows the detection area by raising the threshold value for the detection intensity as shown in a circle of the threshold value Th**1'** in FIG. **20**. When the paper sensor **1901** is not detecting paper, the possibility that a user comes to the paper ejection unit **103** to pick up paper is low. Therefore, the human body detection unit **502** lowers the threshold value for the detection intensity, as shown in the circle of threshold Th**1** of FIG. **20**.

FIG. **21** is a graph showing a relation between detection intensity of the electrostatic capacity detection circuit **701** in FIG. **7** and time with respect to the locus of the user in FIG. **20**.

As an example, a condition where the paper sensor **1901** is detecting paper is shown. The threshold value for detection intensity of the human body detection unit **502** is Th**1'**. Therefore, when the user approaches the paper ejection unit **103** (an arrow **2001** in FIG. **20**) to pick up the paper and then leaves from the paper ejection unit **103** (an arrow **2002** in FIG. **20**), the detection intensity does not exceed the threshold value Th**1'**, which does not generate a return request for returning from the power saving mode to the normal mode.

FIG. **22** is a flowchart showing a process to determine whether a return request for returning from a power saving mode executed by the CPU **503** in FIG. **19** is outputted or not (a return request determination process). A reference sign S is attached to each process step.

After the MFP **101** shifts to the power saving mode, the CPU **503** of the operation unit **104** starts this flowchart.

After shifting to the power saving mode, in S**301**, the CPU **503** determines whether the output of the human body detection unit **502** exceeds the threshold value Th**1'** or not. When exceeded, the CPU **503** determines that a return condition from the power saving mode is satisfied, and notifies the control unit **303** of the return request for returning from the power saving mode in S**304**.

When not exceeded, in S**302**, the CPU **503** determines whether the output of the human body detection unit **502** exceeds the threshold value Th**1** or not. When not exceeded, the CPU **503** determines that the return condition from the power saving mode is not satisfied, and performs the process from S**301**.

When exceeded, in S**303**, the CPU **503** determines the output of the paper sensor **1901**. When there is the paper, since there is a high possibility that the user comes to the paper ejection unit **103** to pick up paper, the CPU **503** determines that the return condition from the power saving mode is not satisfied, and performs the process from S**301** again.

When there is no paper, since there is a low possibility that the user comes to pick up the paper, the CPU **503** determines that the user comes to operate the MFP **101**, and notifies the control unit **303** of the return request for returning from the power saving mode to the normal mode in S**304**.

Although in this embodiment, it is described that the example in which the paper sensor **1901** is arranged on the paper ejection unit **103**, the paper sensor may be arranged on the paper feeding unit **106** in order to distinguish a user who operates the MFP and a user who supplements paper to the paper feeding unit **106**. Furthermore, a toner sensor may be arranged in the toner supplying unit **207** in order to distinguish a user who operates the MFP and a user who supplements the toner.

In a fourth embodiment, it is described that an example that takes measures against a situation in the configuration described in the third embodiment where the threshold value for a human body detection intensity of the human body detection unit **502** varies from Th**1** to Th**1** when a user picks up all the ejected paper and the paper sensor **1901** detects no paper.

In the third embodiment, since the CPU **503** determines that there is no paper at a time when the user picks up all the paper from the paper ejection unit **103**, the threshold value for the human body detection intensity of the human body detection unit **502** varies from Th**1'** to Th**1**. When the user enters an area defined by a circle of the threshold value Th**1** but does not enters the area defined by the circle of the threshold value Th**1'**, the configuration of the third embodiment issues a return request for returning from the power saving mode at the time. This is an incorrect determination.

Dealing with the situation, in the fourth embodiment, a timer is added to the configuration of the third embodiment to reduce the possibility of the incorrect determination. The timer starts measurement when an output of the paper sensor

1901 changes from "paper exists" to "paper does not exist", and measures until a fixed time Td elapses.

When the fixed time Td elapses, the threshold value for a detection intensity of the human body detection unit **502** is changed from Th**1'** to Th**1**. The fixed time Td is set beforehand on an assumption of a period needed for a user who comes to pick up paper to the paper ejection unit **103** and leaves from the MFP **101**. For example, if the period needed for the user to leave from the MFP **101** is assumed as about 3 seconds on average, the fixed time Td is set as 5 seconds by adding a little margin.

FIG. **23** is a block diagram schematically showing a configuration in which the timer **2301** is added to the operation unit **104** in FIG. **3**.

The CPU **503** initializes a timer value of the timer **2301**. The timer **2301** increments the timer value as time elapses. The CPU **503** determines whether the timer value exceeds the fixed time Td or not.

FIG. **24** is a graph showing a relation between detection intensity of the electrostatic capacity detection circuit **701** in FIG. **7** and time with respect to the locus of the user in FIG. **20**.

The user picks up all the paper ejected to the paper ejection unit **103** at T**2401**. At this time, the output of the human body detection unit **502** to which the antenna **501** arranged on the operation unit **104** is connected exceeds the threshold value Th**1**. However, in this embodiment, since a standard value for the human body detection maintains the threshold value Th**1'** in the fixed time Td after the output of the paper sensor **1901** changes from "paper exists" to "paper does not exist", the CPU **503** of the operation unit **104** does not output a return request for returning from the power saving mode.

Although the standard value of the human body detection is changed to the threshold value Th**1** at the time of T**2402** after the fixed time Td elapses, the user leaves from the MFP **101** at this time and the detection intensity is low. Therefore, the return request for returning from the power saving mode is not outputted.

FIG. **25** is a flowchart showing a process to determine whether a return request for returning from the power saving mode executed by the CPU **503** in FIG. **23** is outputted or not (a return request determination process). A reference sign S is attached to each process step.

After the MFP **101** shifts to the power saving mode, the CPU **503** of the operation unit **104** starts this flowchart.

After shifting to the power saving mode, in S**401**, the CPU **503** initializes the timer **2301**. In S**402**, the CPU **503** determines a detection result of the paper sensor **1901**. When paper exists, the CPU **503** initializes the timer **2301** in S**403**. The timer **2301** always counts up. However, since the count-up is unnecessary when the paper exists, the timer is initialized.

When the paper does not exist, the timer **2301** counts up. That is, the timer **2301** counts up from a time when a condition is changed from "paper exists" to "paper does not exist".

In S**404**, the CPU **503** determines whether an output of the human body detection unit **502** exceeds the threshold value Th**1'** or not. When exceeded, the CPU **503** determines that a return condition from the power saving mode is satisfied, and notifies the control unit **303** of a return request for returning from the power saving mode in S**407**.

When not exceeded, in S**405**, the CPU **503** determines whether the output of the human body detection unit **502** exceeds the threshold value Th**1** or not. When not exceeded, the CPU **503** determines that the return condition from the power saving mode is not satisfied, and performs the process from the S**402**. When exceeded, in S**406**, the CPU **503** determines whether the value of the timer **2301** is equal to or larger than the fixed time Td.

When the timer value is smaller than the fixed time Td, there is a high possibility that the paper does not exist or the user does not leave after picking up the paper. Therefore, the CPU **503** determines that the return condition from the power saving mode is not satisfied, and performs the process from the S**402** again.

When the timer value is equal to or larger than the fixed time Td, there is a high possibility that the user leaves from the MFP **101** even if the user came to pick up the paper. Therefore, the CPU **503** notifies the control unit **303** of the returning request for returning from the power saving mode in the S**407**.

As described above, the use of the timer **2301** can reduce a possibility of retuning from the power saving mode when the user picked up all the paper.

While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

This application claims the benefit of Japanese Patent Application No. 2009-061435, filed on Mar. 13, 2009, which is hereby incorporated by reference herein in its entirety.

What is claimed is:

1. An image processing apparatus that has a first mode in which electric power is supplied to a part of the image processing apparatus and a second mode in which electric power is not supplied to the part of the image processing apparatus, the image processing apparatus comprising:

a first detection unit adapted to detect a change of state;

a second detection unit adapted to, in response to, and after, a detected change of state by the first detection unit, start a detecting operation, and detect an object; and

a control unit adapted to switch the electric power mode of the image processing apparatus from the second mode to the first mode in a case where said second detection unit detects the object.

2. The image processing apparatus according to claim **1**, wherein said second detection unit detects the object that approaches to the image processing apparatus.

3. The image processing apparatus according to claim **1**, wherein said control unit switches the electric power mode of the image processing apparatus from the second mode to the first mode when said second detection unit detects the object after a predetermined time period has elapsed.

4. The image processing apparatus according to claim **3**, further comprising a timer adapted to store information indicative of the predetermined time period.

5. The image processing apparatus according to claim **1**, wherein electric power consumption in the second mode is lower than that in the first mode.

6. The image processing apparatus according to claim **1**, further comprising:

a printer unit adapted to print image on paper.

7. The image processing apparatus according to claim **6**, wherein the electric power is not supplied to the printer unit in the second mode, and the electric power is supplied to the printer unit in the first mode.

8. The image processing apparatus according to claim **1**, wherein each of the first detection unit and the second detection unit is a sensor.

9. A control method for an image processing apparatus that has a first mode in which electric power is supply to a part of the image processing apparatus and a second mode in which electric power is not supply to the part of the image processing apparatus, the control method comprising:

detecting, by a first detecting unit, change of state;

in response to, and after, a detected change of state by the first detection unit, starting a detecting operation, and detecting an object, by a second detecting unit;

switching, by a control unit, the electric power mode of the image processing apparatus from the second mode to the first mode in a case where the object is detected by the second detecting unit.

10. The control method according to claim **9**, wherein said control unit switches the electric power mode of the image processing apparatus from the second mode to the first mode when said second detection unit detects the object after a predetermined time period has elapsed.

11. The control method according to claim **9**, further comprising:

printing an image on paper in the first mode.

12. The image processing apparatus according to claim **1**, wherein the operation of the second detection unit is linked to the operation of the first detection unit.

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